AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

APRIL 1, 1958

DESIGN ENGINEERING SHOW NUMBER

In This Issue

A CHILTON PUBLICATION

Shutdowns for lubrication cut in half with

RYKON

Grease

Dollars in production time saved by using RYKON in high temperature service at Northwestern Steel & Wire Company

You expect more from STANDARD and get it!

Bearings on the 46-inch blooming mill manipulator and side guard carrier had to be lubricated twice each eight-hour shift before RYKON Grease was used. The mill had to be shut down while the lubrication work was performed. Now with RYKON, the bearings are greased once each shift. Maintenance men find rollers and pins are still well lubricated. The rollers are subject to almost constant heat and water washing. Steel blooms heated to approximately 2300° F. are just 18 inches away from the RYKON lubricated bearings. The lubricating properties of the grease are unaffected by the heat.

RYKON Grease delivers similar performance results elsewhere in the plant. In roller bearings on the reheating furnace charging tables, in pinch roll bearings and in other trouble spots, where heat and continuous water washing would make short work of other greases, RYKON stands up to the test.

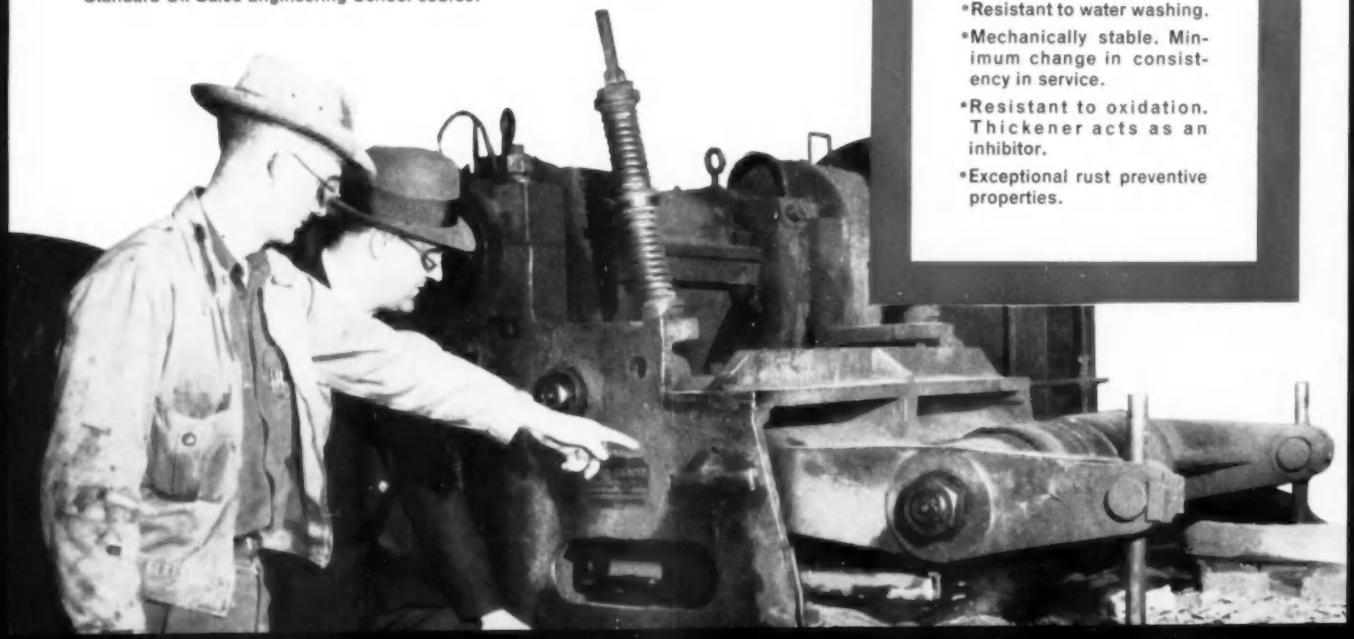
A unique nonsoap, organic thickening agent gives RYKON Grease the ability to provide lubrication in tough-to-lubricate spots long after other greases have failed. This thickener is the result of five years of research effort by a Standard Oil grease research team working to develop an outstanding industrial grease. RYKON Grease is a true multipurpose grease capable of performing all lubrication jobs on one piece of equipment or often in an entire plant.

More facts about RYKON Grease are available from the Standard Oil lubrication specialist that is near you in any of the 15 Midwest and Rocky Mountain states. Call him. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Quick facts about
RYKON Grease

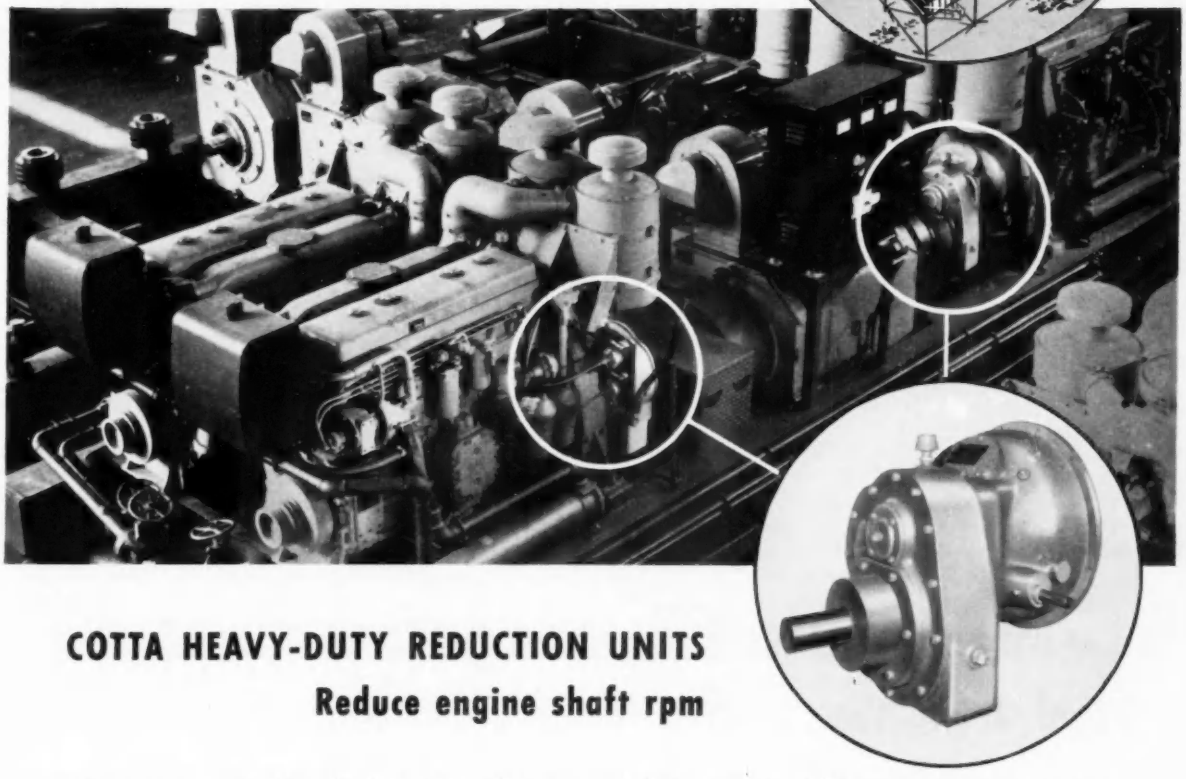
- Stable at high temperatures. At sustained high temperatures RYKON Grease remains soft and grease-like.
- Resistant to water washing.
- Mechanically stable. Minimum change in consistency in service.
- Resistant to oxidation. Thickener acts as an inhibitor.
- Exceptional rust preventive properties.

Lubrication time cut. Mill feeder pinch roll bearings formerly lubricated twice each eight hours. Now with RYKON Grease, lubrication is needed only once each shift. Elbert Dean, Northwestern Steel lubrication engineer, and Standard Oil lubrication specialist, Charles Daub, inspect bearings. Counseling people who have lubrication jobs like this is work for which Chuck Daub is well-qualified. Chuck has 12 years' experience in lubrication technical service work. He has an engineering degree from Illinois Institute of Technology and has completed the fifteen week Standard Oil Sales Engineering School course.



5000 hp round the clock

COMPACT PACKAGES SHARE THE POWER LOAD, KEEP OFF-SHORE RIG RUNNING



COTTA HEAVY-DUTY REDUCTION UNITS

Reduce engine shaft rpm

Continuous power for diesel-electric off-shore drilling rigs is furnished by a new method of heavy-duty power generation . . . compact power packages. Each package consists of two 600 hp generators and four 250 hp diesel engines. Five power packages capable of a combined output of 5000 hp are used in the rig. Cotta Heavy-Duty Reduction Units are used to harness engines to the lower rpm generators.

All four or any combination of the four engines in each power package can drive either or both of the generators. This assures constant power even if one engine is cut out. The need for continuous, dependable operation under severe conditions is a major reason why Cotta Reduction Units are used in these Stewart & Stevenson RIGELECTRIC generator packages. Long-run, dependable service with minimum maintenance has made Cotta the choice for a variety of heavy-duty speed conversion jobs. If you need a standard or special reduction unit in the input torque range of 150 to 2000 ft lb, get the full Cotta story.

THIS INFORMATION WILL HELP YOU

Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

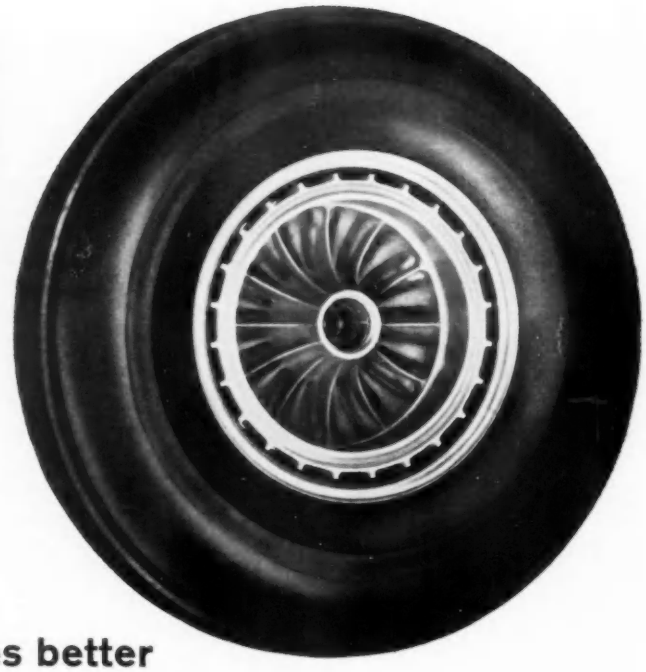
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

COTTA
HEAVY-DUTY
REDUCTION UNITS

"Engineered-to-order"

Looks better



brakes better

New integrated wheel has Nickel-iron brake drum metallurgically bonded to cast aluminum body

In this interesting prototype, wheel, hub, and brake drum are combined as a single integrated part . . . lighter (in 14" rim size) by 12.6 pounds than present assemblies . . . stronger (notice the ribs) . . . cooler operation.

Its performance and durability, Kaiser Aluminum & Chemical Corporation tests show, far surpasses accepted standards. Reduced brake fade is due, in part, to the high conductivity of the aluminum alloy used for the wheel disc; in part, to design (heat flow path is direct), and in part to the ribbed die cast construction of the disc. The excellent performance of the braking surface is obtained by using a Nickel cast iron insert.

1% Nickel cast iron fulfills design needs

In designing the brake drum insert, engineers turned at once to the proven superiority of nickel-containing irons. An alloyed iron containing 0.80 to 1.00% Nickel, 0.30 to 0.50% chromium, and 0.20 to 0.40% molybdenum is the one they picked to withstand the heat wear and thermal shock conditions of brake drum service.

After casting and machining the insert, it is bonded to the cast aluminum disc by the Al-Fin* process.

If you would like to know more about the Kaiser wheel, contact Kaiser Aluminum & Chemical Corporation. When it comes to nickel-containing cast irons, look to Inco for information. One particularly useful publication is Inco's 28-page "Guide to the Selection of Engineering Irons". Write for a copy.

*Trademark of Al-Fin Division of Fairchild Engine & Airplane Co.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street INCO New York 5, N. Y.

INCO NICKEL

NICKEL ALLOYS PERFORM BETTER LONGER

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

APRIL 1, 1958 — VOL. 118, NO. 7

FEATURES

NEWS PREVIEWS

DEPARTMENTS

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: To manufacturers in and suppliers to the automotive industries in the U. S., U. S. Possessions and Canada, $2.00 per year; $3.00 for 2 years. All Others, $10.00 per year. Single copies, 50¢. Statistical Issue, $1.00.

HOW MANY WAYS CAN *Special Purpose Fasteners* CUT COSTS FOR YOU?

How many of your products employ laborious, old-fashioned fastening methods where simple fasteners could do the job and cut costs, too? How many parts and sub-assemblies can be adapted to include a self-fastening feature? How many future products could be improved by advance planning for fastener efficiency?

United-Carr's engineering staff offers you a wealth of experience in the design of special-purpose fasteners and self-fastening devices. Large-scale manufacturing facilities (including in-plant plastics molding equipment) ensure economical, *volume* production and prompt deliveries. United-Carr field representatives are ready to call on you at *your* request.

See us at Booth No. 422, Design Engineering Show

POLYETHYLENE MOUNTING FOOT

No mar, no scratch glide for use on TV receivers, record changers, small appliances, etc. Assembles into round hole in wood or metal cabinets.

NYLON SNAP-IN NUT

Snaps into square hole stamped out of sheet metal . . . provides secure anchorage for any sheet metal or self-tapping screw . . . highly effective electrical insulator.

QUICKEY FASTENER

Eliminates need for welding or swaging studs to sheet metal stampings, facilitates nesting, eliminates damage in transit because Quickey snaps in before final assembly.

THREAD CUTTING FASTENER

Re-usable, self-locking, vibration-proof fastener cuts clean, deep threads on unthreaded chrome-plated studs. Available for ⅛", 3/16" and ¼" studs. Can be driven with standard wrenches.

PLUG BUTTONS

Snap into ⅛" to 3" dia. holes. Can be embossed with ornamental or functional designs . . . various finishes, shapes and sizes.

FISHTAIL RATCHET PLATE

Holds on smooth, die-cast metal or plastic studs to anchor name plates, trade marks etc. on appliances, automobiles, electronic apparatus, etc.

TRIMOUNT STUDS

Hold two or more thicknesses of material together. Easily installed by hand. Insure vibration proof attachment. Permanent or removable. Many shapes and sizes.

V-LOCK TEENUT

Re-usable, self-locking, one-piece, all-metal nut has high tensile strength, is unaffected by heat or oils. In various shapes, sizes and metals.

SOL-A-NUT

Self-locking, rustless, heat resistant. Sturdy, one-piece stainless steel construction prevents corrosion if nicked or scratched.

DURABLE DOT FASTENER

Snap fastener for cloth, leather, plastics and other materials. Positive closure, instant release. Black, nickel or brass finish.

CARR FASTENER COMPANY

Division of United-Carr Fastener Corp., Cambridge 42, Massachusetts

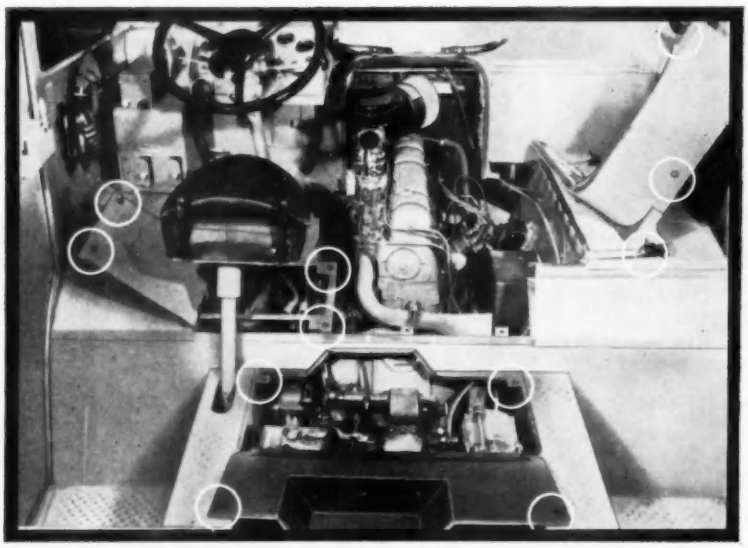
MAKERS OF DOT FASTENERS

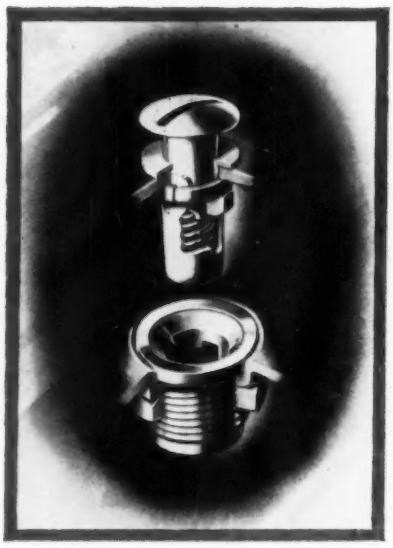
Design problem:

Fastening of removable panels

Your best answer:

Economical, easy-to-install QUICK-LOCK





Photograph courtesy Divco-Wayne Corporation, Detroit, Michigan

In Divco delivery trucks,

QUICK-LOCK guarantees

trouble-free opening and closing

of cowlings and access panels

Among the outstanding design features which have contributed to the success of Divco door-to-door delivery vehicles is the sure, quick closing and opening of cowlings and panels. To provide easy access to engine and transmission, Divco specifies Simmons QUICK-LOCK on demountable covers of various shapes and thicknesses.

QUICK-LOCK has unlimited applications in the electrical and electronic, automotive, appliance, aircraft, and other manufacturing fields. *Here's why* millions are in use today on many types of valuable equipment cases, weather-tight lighting units, voltage regulators, engine panels, and access panels and doors:

- A 90-deg. turn locks and unlocks QUICK-LOCK. No special tools needed.
- Stud is self-aligning; speeds up mounting and demounting of removable panels.
- When unlocked, stud is self-ejecting—easily checked by visual inspection.
- Various stud and receptacle types... oval, flush, and wing-head studs; easily installed plate and screw-type receptacles.
- Helical spring in stud supports initial load; solid stud part holds increased load.
- Design features allow for curved sheet installation, and even slight misalignment of holes.
- *Maximum economy in production* assured by single hole mounting of screw-type receptacle.

Send today for the Simmons Catalog

Where does QUICK-LOCK belong in your design? For complete information and specifications, write for the Simmons Catalog today. Samples and free engineering service are available upon request.

Visit us at Booth 1020
DESIGN ENGINEERING SHOW
International Amphitheatre, Chicago
April 14-17, 1958

SIMMONS
FASTENER CORPORATION
1749 North Broadway, Albany 1, New York
QUICK-LOCK • SPRING-LOCK • ROTO-LOCK • LINK-LOCK • DUAL-LOCK

See our 8-page catalog in Sweet's 1958 Product Design File

SF 100

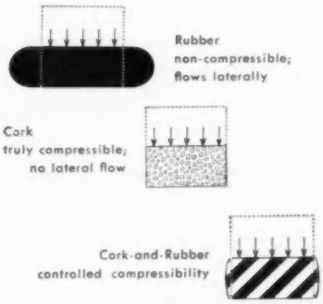
Technical data for gasket design and selection

NUMBER ONE

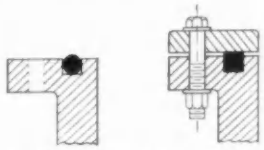
How to cut the cost of O-rings

Molded rubber O-rings are incompressible and therefore must be made to close tolerances to fit perfectly between the flanges. An O-ring too small in cross-section will not seal effectively . . . oversize O-rings prevent flange contact.

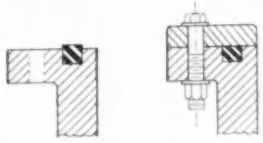
Inexpensive lathe-cut rings of re-



silient cork-and-rubber combine the compressibility of cork with the incompressibility of rubber. A controlled



O-rings made of straight rubber compounds are incompressible; if they're even slightly oversized, the joint will not close.



Cork-and-rubber rings are compressible and may be cut to full channel width and from 20–33% deeper than the channel.

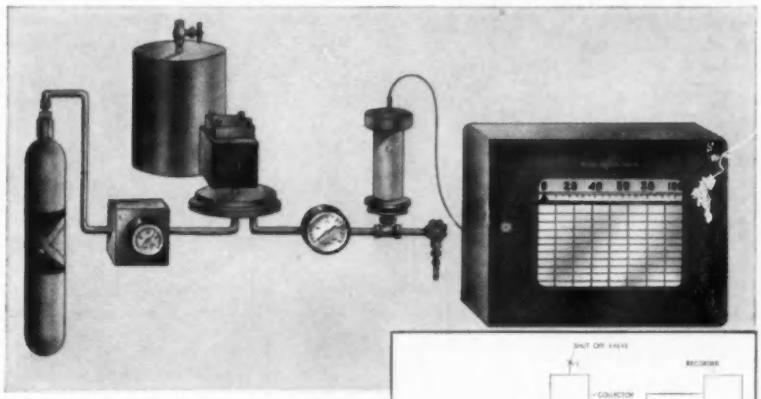
compressibility range of from 20% to 33% can be achieved, eliminating the need for close tolerances.

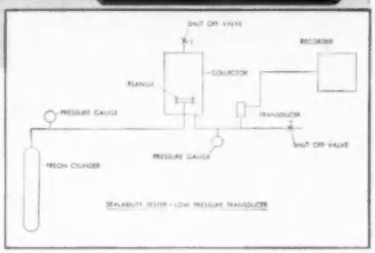
For your free copy of this new booklet, write Armstrong Cork Company, Industrial Division, 7104 Imperial Ave., Lancaster, Pennsylvania.

Testing the sealing characteristics of refrigeration compressor gaskets

Sealing a refrigeration compressor can be a tough gasket problem. The effects of elevated temperature and high internal pressure are aggravated by the tendency of refrigerants to attack some gasket materials.

In developing an improved gasket for compressors, Armstrong research engineers tested commercially available materials. They found that none of these provided a gas-tight seal. In order to test the behavior of these materials—as well as the performance of Armstrong compounds under development—it was necessary to know how much leakage was involved and the effect of time on the leakage rate.





The apparatus shown here provides such information. FREON* refrigerant under 128 psi at 72° F. is piped to a gasketed compressor flange covered by a sealed collector. Leakage is sensed by a transducer as an increase in pressure in the collector. The increases are continuously recorded.

With this apparatus, the effect on gasket materials of such gases as FREON refrigerant can be observed and evaluated. As one example, it is known that this gas has a pronounced swelling effect on unconfined samples of gasket materials that contain nitrile-type rubber. In this device, however, materials are tested under normal compression, and tests show that the swelling effect of the FREON improves the sealing efficiency of the gasket.

As a result of such testing, Armstrong has developed a new high-density asbestos gasket material—Accopac AN-890. This new product seals better than some conventional materials, and it offers a cost saving of from 15% to 30%.

At Armstrong, research on problems of gasket design, selection, and performance is a full-time activity. This work may be of help in solving a sealing problem for you. We'll be glad to make recommendations if you send details to us.

*FREON AND COMBINATIONS OF FREON- AND F- WITH NUMERALS ARE REGISTERED TRADE-MARKS OF THE E. I. DU PONT DE NEMOURS & CO., INC., FOR ITS FLUORINATED HYDROCARBON REFRIGERANTS.

Armstrong GASKET MATERIALS

. . . used wherever performance counts

For greater selling impact

MOTO-MOWER

FORMS SEAT and SHROUD

from

CYCOLAC® SHEET

HIGH-IMPACT THERMOPLASTIC RESIN

HERE'S WHAT CYCOLAC SHEET MEANS TO MOTO-MOWER

The Moto-Mower Division of Detroit Harvester Co. designed a colorful, comfort-molded seat and a lightweight, long-lasting shroud for its Moto-Mower Power Lawn Mower. Replacing costly, heavier metal in these particular applications, Cycylac was greatly responsible for the development of a lighter-in-weight power lawn mower . . . a more economical-to-manufacture, easier-to-sell unit, designed to take severe use and abuse in dependable stride.

Cycolac Sheet Extruded and Formed by: Panelyte Division, St. Regis Paper Company, Richmond, Indiana

THIS IS CYCOLAC... AND WHAT IT CAN DO FOR YOU!

This family of single uniform resins is extremely tough and versatile; extrudes readily, in profiles and sheets; easily injection molded and post formed.

- Wide range of process properties
- Fast extrusion to accurate dimensions
- Nerve-free calendering to exact gauge
- Adjustable to all methods of sheet forming
- Readily injection molded in fast cycles

Write for technical literature today!

PACESETTER IN

Marbon CHEMICAL

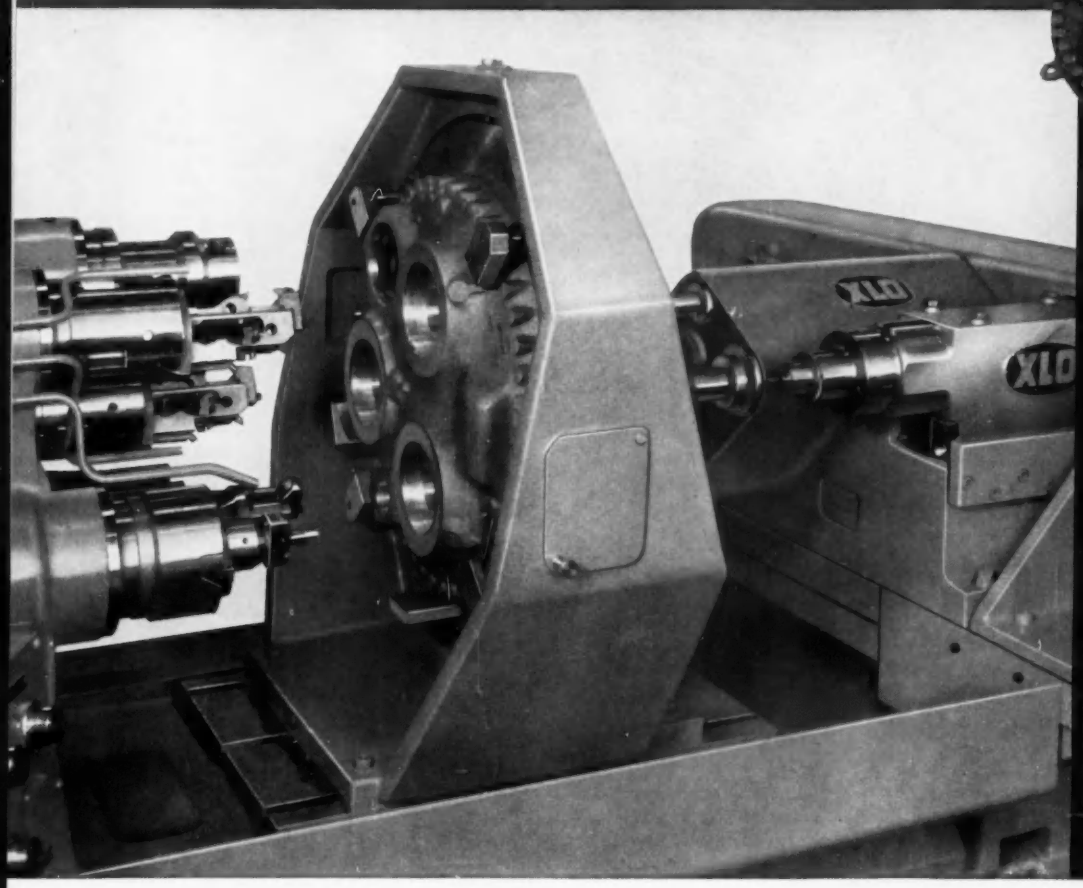
SYNTHETIC RESINS

Division of BORG WARNER • Gary, Indiana

also represented by:

WEST COAST: Harwick Standard Chemical Co., Los Angeles, Cal.
CANADA: Dillons Chemical Co. Ltd., Montreal & Toronto
EXPORT: British Anchor Chemical Corp., New York

How to precision finish 42 surfaces in one cycle



Back and front view of the bored casting. Part will eventually house a precision gear train. All hole sizes and locations are held to .001" tolerances.

Close-up of part mounted in its hydraulically-operated fixture. Notice straddle facing tools mounted on boring spindles.

XLO
EX-CELL-O FOR PRECISION

57-70

These magnesium cast aircraft gear housings are being bored, faced and chamfered, 42 precision operations overall in one cycle on a single Ex-Cell-O 17-A precision boring machine! What's more, all diameters and locations are being held to .001" tolerances.

The ability of this and other Ex-Cell-O boring machines to perform multiple precision operations is recognized throughout the metalworking industry. This reputation, backed by years of leadership, is your assurance that precision boring is best done by an Ex-Cell-O machine.

For full information on the complete line of Ex-Cell-O precision boring machines, including the one best suited to your production standards, get in touch with your local Ex-Cell-O Representative. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

NEW! Prompt response to speed and load changes with Thompson Turbocharger

Moving parts in the new-design Thompson Turbocharger for diesel engines are made of light alloys to reduce inertia to speed changes. Response of the Thompson Turbocharger to variations in engine speed and air requirements is almost instantaneous . . . no ragged engine performance due to lag in blowing.

The light alloy impeller also permits bearings to be simpler in design. Shafts can be smaller in diameter to reduce bearing surface speeds and increase bearing life.

Other advantages of the new Thompson design include: straight-bladed impeller for high pressure ratios over wide range of air flow, new-design diffuser for peak performance over wider operating range, and unique design to isolate exhaust heat from bearings and air-side of Turbocharger.

Your diesel engines up to 300 horsepower can readily be equipped with Thompson Turbochargers . . . the most modern design available. A Jet Division engineer will call at your convenience to work with your engineers.

Write today on your company letterhead for Booklet AI-458, which contains technical data on Thompson Turbochargers for blown diesel engines up to 300 horsepower.

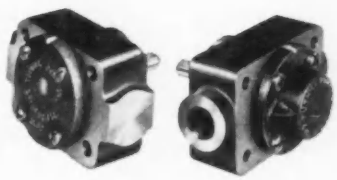
JET DIVISION

Thompson Products, Inc.

Cleveland 17, Ohio

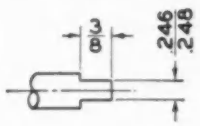
NOW! Have Reliable Lubrication at Minimum Cost

Models LF and RF
Capacities 55-170 g.p.h. at 1800 r.p.m.
Designed for flange mounting without shaft seal; with *choice* of internal or external porting. Model RF has automatic reversing feature which permits driving the pump in either direction...without changing direction of flow or port positions.

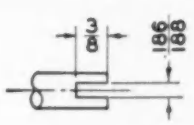


Models LFD and RFD
Capacities 60-180 g.p.h. at 1800 r.p.m.
Designed for non-directional service; for flange mounting with internal porting. Variations for external porting and/or shaft seal are shown below. Model RFD has the automatic reversing feature which permits driving the pump in either direction...without changing direction of flow or port positions.

ALTERNATE SHAFT DRIVE ENDS
For All Models



MODIFICATION "A"



MODIFICATION "B"

Tuthill "Cartridge-Type" Pumps Solve This Problem for Plant Maintenance...and Original Equipment Manufacturing

Durable—Reliable—and Available from Stock!

1. The demand for minimum cost lubrication pumps without sacrifice in performance, durability and reliability is *ideally* satisfied by the TUTHILL series of Models LF, RF, LFD and RFD *cartridge-type* pumps.

2. TUTHILL "cartridge" pumps get their reputation as cost-savers from their special design for original equipment use, their durable construction, their reliability...and the fact that they are *available from stock*. Note their compact size as shown in the photos above. Consider how all waste space has been eliminated for more adaptability. Think how they can be easily applied to your *own* requirements...in your plant...or in your equipment manufacturing plans.

3. These variables are available:
- **a.** Pumps with...*or without*...automatic reversing performance
- **b.** Pumps with...*or without*...a shaft seal
- **c.** Pumps with internal...*or external*...porting
- **d.** Pumps with *variations* of both internal and external porting

4. TUTHILL Catalog Section 108 contains line drawings showing each model in detail, shaft rotation and porting arrangements and other vital statistics to help you select the RIGHT model. Fill out the attached coupon—or write.

TUTHILL PUMP COMPANY
941 E. 95th Street, Chicago 19, Illinois

Gentlemen:
- ☐ Please send me Catalog Section #108
- ☐ Please send the complete catalog on the Tuthill line
- ☐ Have your representative call

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

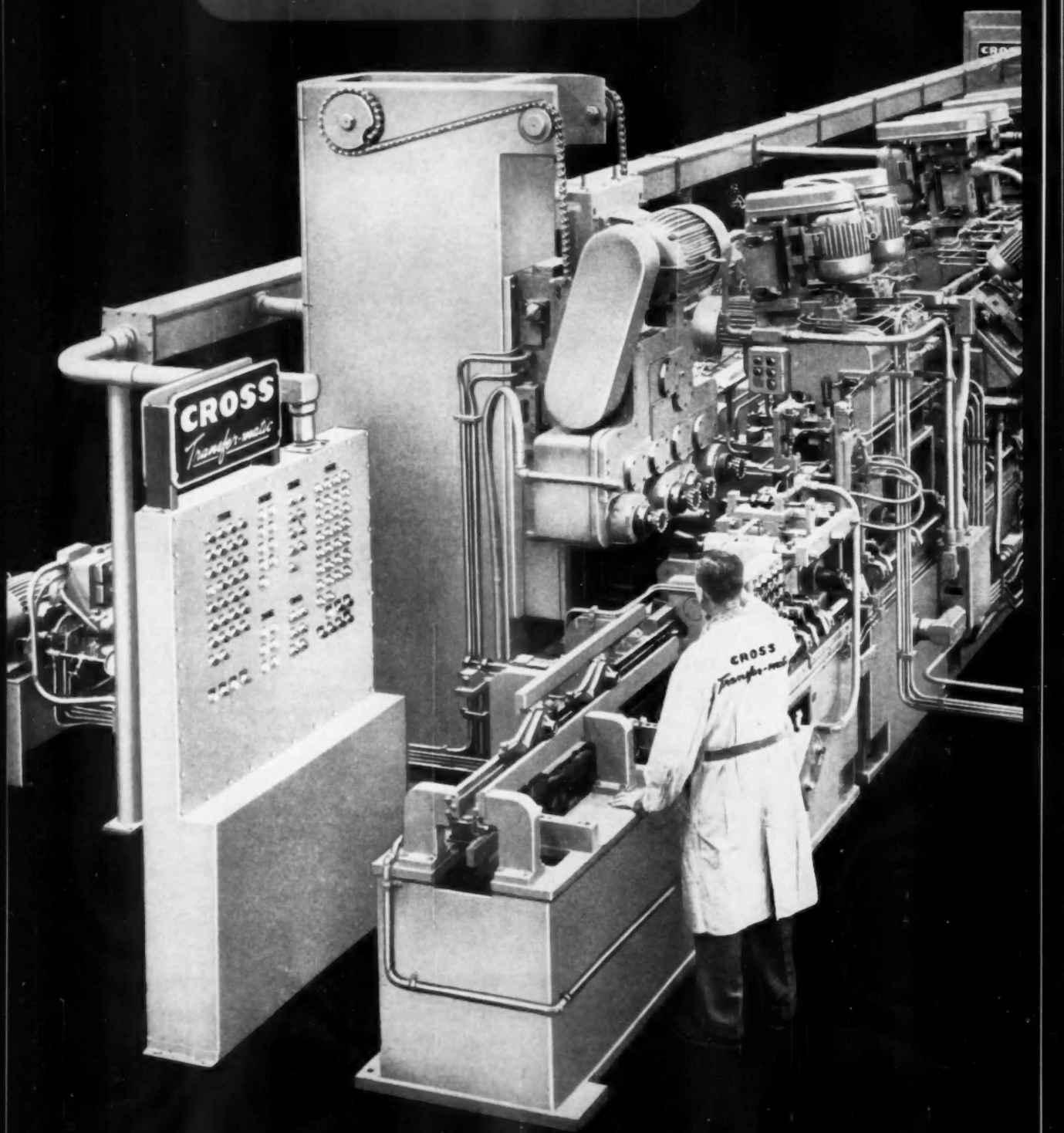
Tuthill Manufactures a Complete Line of Positive Displacement Rotary Pumps in Capacities from 1 to 200 GPM, for Pressures to 600 PSI, Speeds to 3600 RPM.

TUTHILL PUMP COMPANY

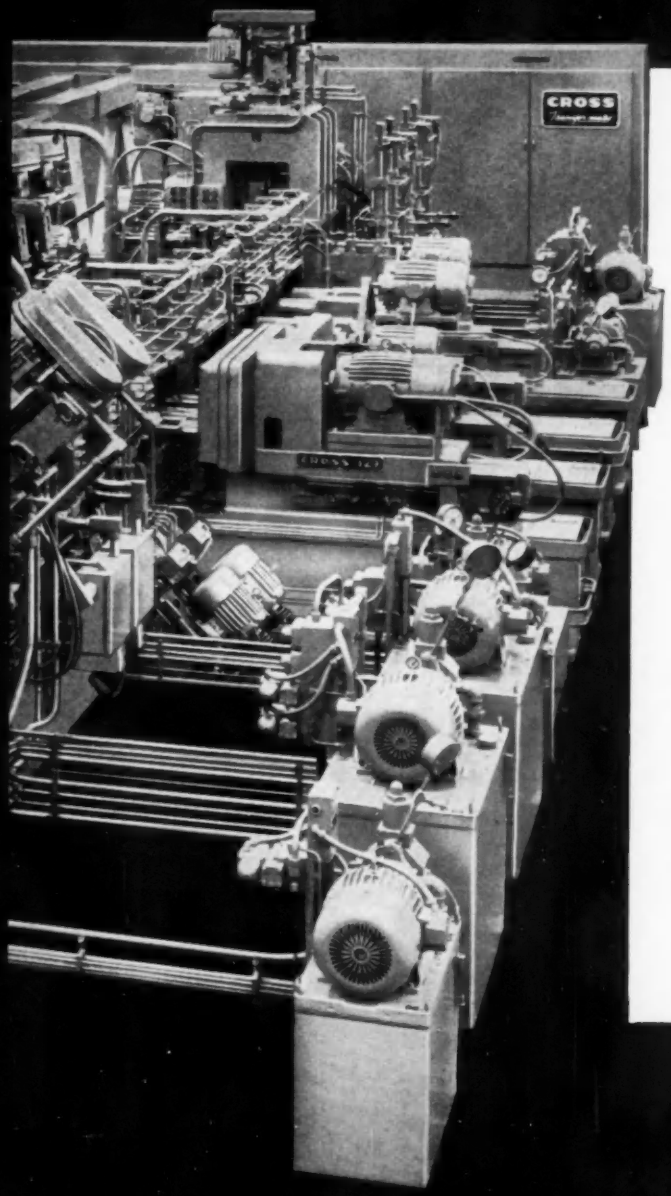
941 East 95th Street, Chicago 19, Illinois
Canadian Affiliate:
Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

PUMPS FOR YOUR PURPOSE

Complete Machining of Water Pump Bodies



Another Transfer-matic by Cross



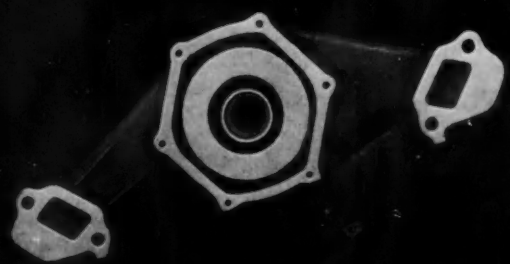
- ★ **Machines two castings simultaneously at rated capacity of 200 pieces per hour.**
- ★ **Station 1 load; Station 2 mills mounting faces; Station 3 drills thermostat by-pass hole, mainshaft hole and four mounting holes; Station 4 cross-faces cover face and drills one angular vent hole; Station 5 chamfers thermostat by-pass hole, drills six cover holes, spot-faces mainshaft hole on inside; Station 6 cross-faces impeller face, reams thermostat by-pass hole and drills second angular vent hole; Station 7 spotfaces and chamfers mainshaft hole, spotfaces four mounting holes and drills by-pass hole on inside; Station 8 finish cross-faces impeller face and recesses center of mainshaft hole; Station 9 semi-finish bores mainshaft hole; Station 10 finish precision bores mainshaft hole; Station 11 tap drills heater connection hole and probes cover holes; Station 12 taps heater connection hole and six cover holes; Station 13 automatically unloads two pump bodies.**
- ★ **Locating: in Station 2, parts are located from foundry pads; in Station 3, from milled faces and cored water passages; and, from Station 4 on, from milled faces and two mounting holes.**
- ★ **Cross' "building block" principle provides flexibility for future part design changes.**
- ★ **Other features include: complete interchangeability of all standard and special parts for easy maintenance, construction to JIC Standards, hardened and ground ways and automatic lubrication.**

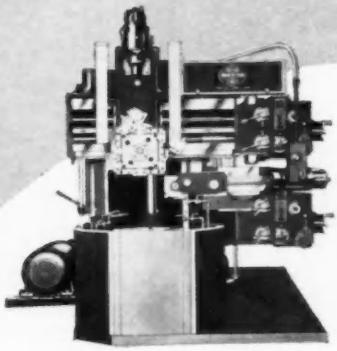
Established 1898

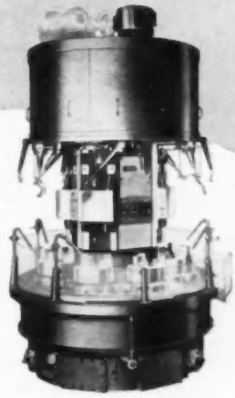
THE **CROSS** CO.

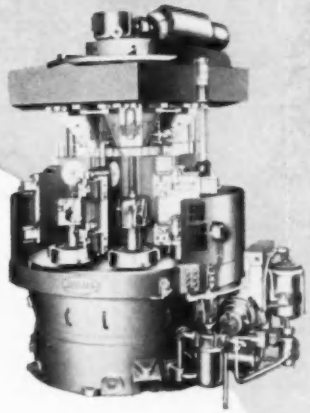
First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN









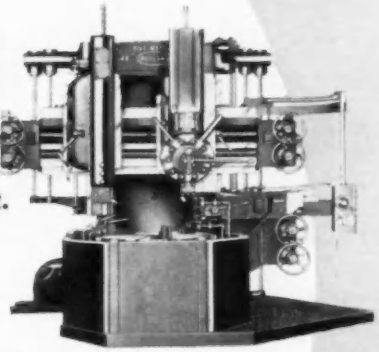
Rebuilding?

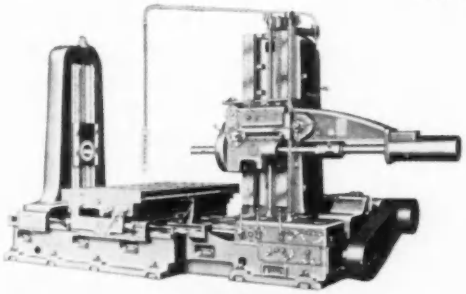
Yes Sir, We're Interested!

A Machine Rebuilding Program has been established which permits us to offer you excellent service on rebuilding your present Bullard equipment.

We believe that our facilities offer you many advantages including:

1. "Original manufacturers" know-how.
2. Genuine replacement parts.
3. Full year's guarantee on all parts replaced including labor costs.
4. All work done by factory-trained assembly personnel.



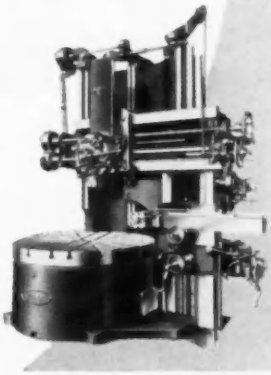


FOR YOU, THIS MEANS TOP VALUE
... DOLLAR FOR DOLLAR ...
WHEN REBUILDING

BULLARD

MACHINE TOOLS

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT



we invite your inquiries

USE THIS COUPON...

Gentlemen: Please have your representative call to discuss the rebuilding of our

- ☐ Bullard Vertical Turret Lathe
- ☐ Horizontal Lathe
- ☐ Horizontal Boring Machine
- ☐ Spacer Table
- ☐ Mult-Au-Matic
- ☐ Contin-U-Matic

YOUR NAME_____ TITLE_____

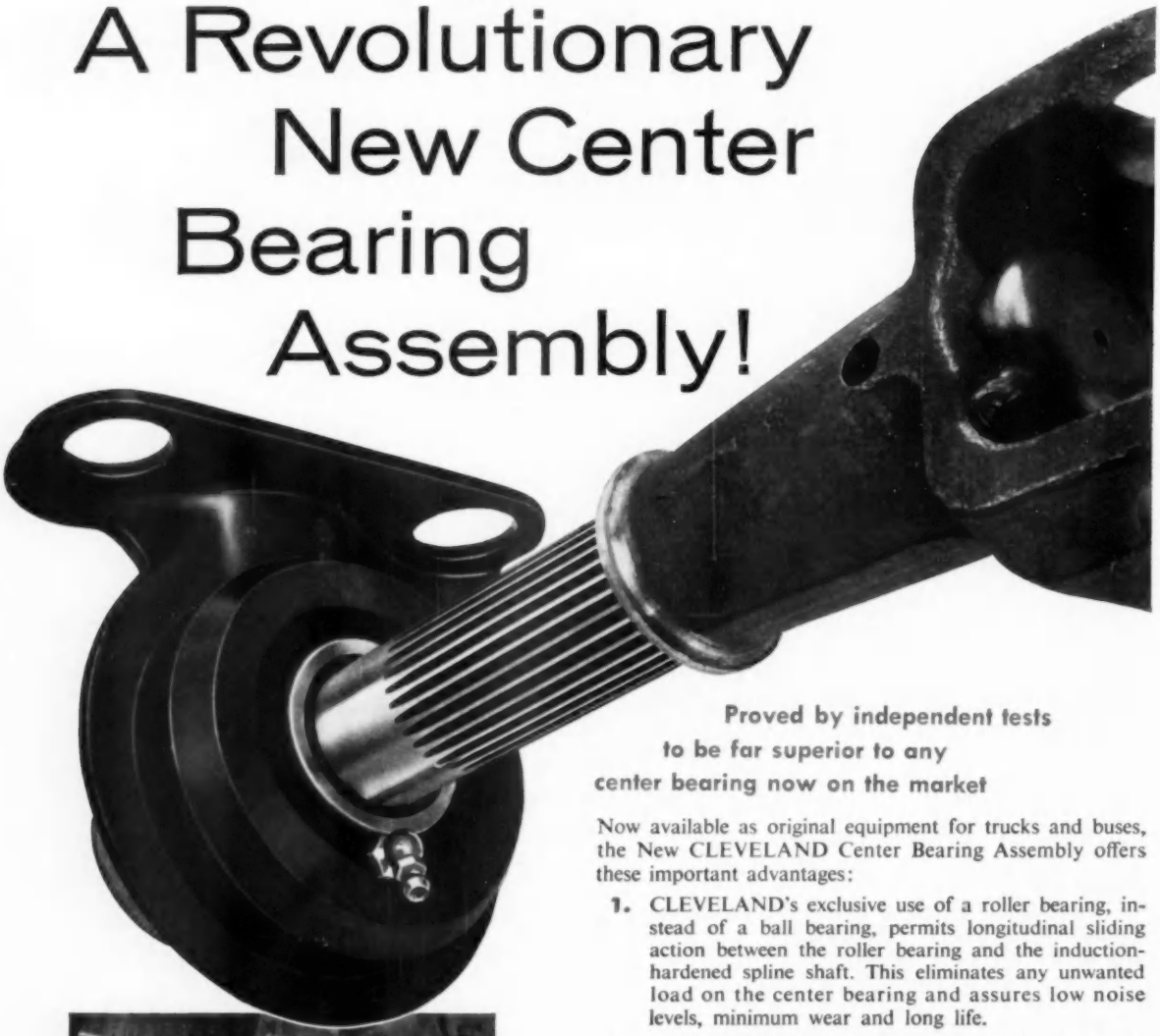
COMPANY_____

ADDRESS_____

CITY_____ STATE_____

From **CLEVELAND** . . .

A Revolutionary New Center Bearing Assembly!



Proved by independent tests to be far superior to any center bearing now on the market

Now available as original equipment for trucks and buses, the New CLEVELAND Center Bearing Assembly offers these important advantages:

1. CLEVELAND's exclusive use of a roller bearing, instead of a ball bearing, permits longitudinal sliding action between the roller bearing and the induction-hardened spline shaft. This eliminates any unwanted load on the center bearing and assures low noise levels, minimum wear and long life.
2. CLEVELAND's new design absolutely eliminates center bearing "shudder". Also, it eliminates longitudinal misalignment problems between frame and bearing bracket.
3. CLEVELAND's Center Bearing Assembly embodies a conventional type grease fitting and lubrication channels to permit a complete flushout of any injurious road dirt.

Write for information on this remarkable new product. It's the answer to center bearing problems.

Since 1912

Cleveland Steel Products Corporation

Automotive Division

16025 Brookpark Road, Cleveland 11, Ohio

Universal Joints · Propeller Shafts
Power Take-Off Joints
Center Bearing Assemblies

Waldes Truarc GRIP RINGS Replace Expensive Parts... Reduce Manufacturing Costs...Eliminate Rejects

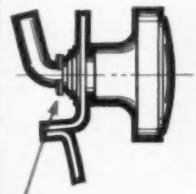
WALDES TRUARC SERIES 5555 GRIP RING*

application: external for shafts

range: .077 in. — .755

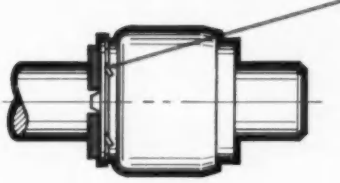
The Waldes Truarc Grip Ring requires no groove, holds fast by friction forces, can be used again and again. It provides a positioning shoulder secure against moderate thrusts or vibration. The ring's unusually large radial width exerts considerable frictional hold against axial displacement.

*U. S. Pat. No. 2,574,034



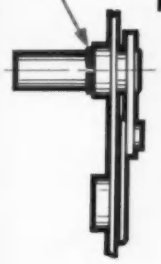
Rings cut costs 33%, eliminate rejects

B & J Tool uses series 5555 grip ring to secure parts of damper control made for Vulcan Radiator. Shaft formerly was machined down to provide coil spring shoulder, often broke during bending operation. (Rejects ran as high as 80%!) New design eliminated rejects and field failures, cut production costs 33%.



Rings save $300 per die, $.03 unit

Ray Oil Burner Co. uses a Truarc series 5555 grip ring in fuel pump drive shaft to position seal and drive it to assure continuous rotation with shaft. Original design used complicated die-cast collar and driver which required special groove and shoulder. Savings: $300 per die for each size manufactured, $.03 per part.



Rings save $32.42/M:

Swift Business Machine Co. replaced collars and set screws in hollow shaft assembly of its adding machine with series 5555 grip rings, saving $32.42 per 1000 units. Rings require no groove, make possible positioning adjustments without slippage encountered when set screws were used.

Whatever you make, there's a Waldes Truarc Ring designed to save you material, machining and labor costs, and to improve the functioning of your product.

In Truarc, you get

Statistically Controlled Quality from engineering and raw materials to the finished product. Every step in manufacture watched and checked in Waldes' own modern plant.

Complete Selection: 36 functionally different types. As many as 97 standard sizes within a ring type. 5 metal specifications and 14 different finishes. All types available quickly from leading OEM distributors in 90 stocking points throughout the U. S. and Canada.

Field Engineering Service: More than 30 engineering-minded factory representatives and 700 field men are at your call.

Design and Engineering Service not only helps you select the proper type of ring for your purpose, but also helps you use it most efficiently. Send us your blueprints today . . . let our Truarc engineers help you solve design, assembly and production problems . . . without obligation.

WALDES

TRUARC®

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, N. Y.

Waldes Kohinoor, Inc., 47-16 Austel Place, L.I.C.1, N.Y.
Please send new, descriptive catalog showing all types of Truarc rings and representative case history applications.

(Please print)

Name_____

Title_____

Company_____

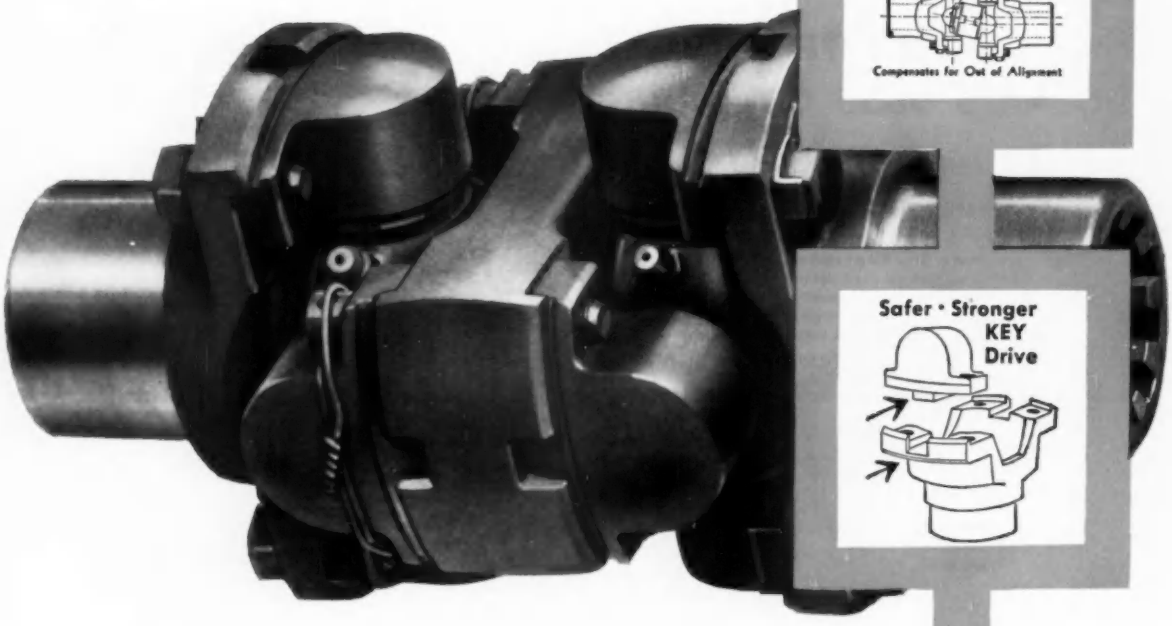
Business Address_____

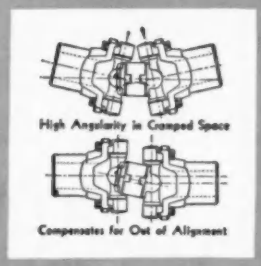
City_____ Zone____ State_____

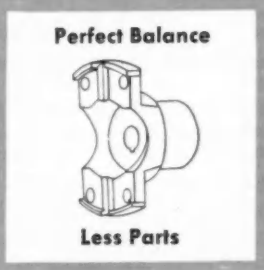
AY-040

Consult the Yellow Pages of Your Telephone Directory for Name of Local Truarc Factory Representative and Authorized Distributor.

Let These MECHANICS Advantages Help Solve YOUR Joint Problems





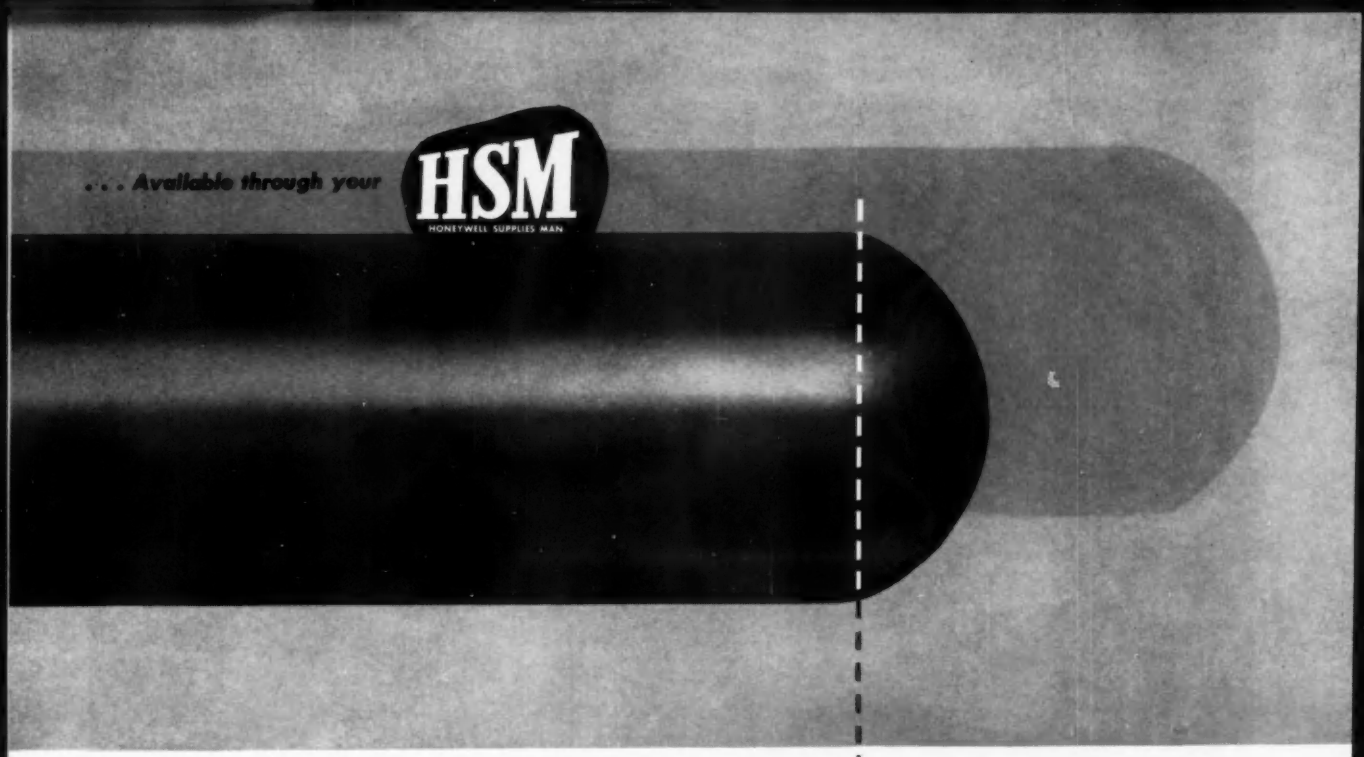


Whether your universal joint problem is angularity, alignment, limited space, torque, safety, assembly cost, parts stocks or servicing delays—MECHANICS JOINTS provide definite, practical solutions. Send us a print or description of your particular joint needs—for MECHANICS engineers' recommendations to overcome your drive line difficulties.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner • 2024 Harrison Ave., Rockford, Ill.
Export Sales: Borg-Warner International
79 E. Adams, Chicago 3, Illinois

MECHANICS
Roller Bearing
UNIVERSAL JOINTS

For Cars, Trucks, Tractors, Farm Implements, Road Machinery, Industrial Equipment, Aircraft



SPUN-END

Protecting Tubes

for long, reliable thermocouple service

Spun-end construction adds extra quality to Honeywell closed-end drawn metal protecting tubes . . . at no increase in price.

These tubes keep thermocouple wires safe from corrosion and mechanical damage. They're made to withstand the toughest abuse you'll give them on the job.

Available in carbon steel, seamless steel, stainless steel, *Inconel**, *Resisteat***, nickel and wrought iron.

Order from your Honeywell Supplies Man. He can give you valuable assistance with your process control problems, as well as help you select pyrometer supplies. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

**Inconel is a trade name of the International Nickel Company.*
***Resisteat is a trade name of Minneapolis-Honeywell Regulator Co.*

Honeywell

H HONEYWELL

First in Controls

REDUCE REJECTS

...with fasteners that assemble easily

Ferry Cap cuts no corners when it comes to accurate threading and close inspection. Ferry Cap fasteners assemble smoothly and quickly because they are precision made and because inspection takes place not once, not twice, but at every stage of manufacture —from raw material to finished product.

You'll like the fasteners you get from Ferry Cap... and you'll like our speedy delivery, too!

THE FERRY CAP & SET SCREW COMPANY

Makers of the famous Coustr-Bar® Screw for socket head applications.

2191 SCRANTON ROAD • CLEVELAND 13, OHIO

FERRY CAP *is geared to FASTER SERVICE*

Series 101A
150 psi Air
1500 psi Hydraulic
Meet JIC Standards
Fit where
others won't!

O-M Cylinders give power new dimensions in close quarters

Compared with cylinders of conventional design, having the same size bore, and activated by the same operating pressure, O-M's original Internal Key-type Cylinders develop more power in ⅓ less space on both air and hydraulic circuits.

These compact, powerful components, that fit where others won't, are ruggedly constructed to stand up under protracted service within a wide range of operating pressures. The O-M Internal Locking Key simplifies disassembly, inspection, and service with no alignment problems in reassembly. Besides, the ports can be oriented to any position.

The unique O-M design also assures maximum versatility. By using a majority of standard parts, you get the advantage of "special" cylinders designed to do your job better at a very nominal cost over standard cylinders. These and other engineering advantages and economies of O-M Internal Key-type Cylinders suggest uses in a wide variety of original equipment.

O-M Internal Key-type Air and Hydraulic Cylinders are available in a complete range of sizes (1½" to 8" bores) with standard or heavy-duty rods. Completely interchangeable parts and mounts. Immediate delivery on many sizes.

Mail Coupon TODAY *for Bulletins 101A (O-M Internal Key-type Air and Hydraulic Cylinders), and 105 (O-M Series T-H Heavy-Duty Hydraulic Cylinders).*

ORTMAN-MILLER MACHINE COMPANY
17 143rd Street, Hammond, Indiana

☐ Have representative call
☐ Send Bulletins 101A and 105

Name_____ Position_____

Company_____

Address_____

City_____ Zone____ State_____

LET MAGNA repeat these savings

VISIT CP BOOTH 1804
See These Tools In Action:
- **Torque Control Tools**
  (Cam-tork and Magnamatic)
- **Broaching**
- **Multi-spindle**

Breakage of plastic handles was spiralling assembly costs at the Line Material Industries, Zanesville, Ohio. The culprit—overtightened screws which caused a large number of handles to hit the scrap bin daily.

A CP Magnamatic screwdriver was installed in September 1956 and has been saving this company over $2000 a year in spoilage alone. Assembly time has been cut by 12%. The Magnamatic One-Shot Clutch runs each screw to the exact pre-set torque then "shifts to neutral"—virtually eliminating breakage. There's no ratcheting, burred screw heads or damaged work. And the uniformity of the Magnamatic's precision tightening action provides a final product inspection that assures complete quality control... eliminates any need for final hand torquing.

Get the facts first hand! Mail the coupon today for prompt action or detailed information!

MATIC
in your plant!

Chicago Pneumatic Tool Company, Dept. M-94
8 East 44th Street, New York 17, N. Y.

- ☐ Please send me FREE booklet SP-3165 "Magnamatic Case Histories."
- ☐ Please send me "Magnamatic" Bulletin SP-3126.
- ☐ Have representative call.

Name_____ Title_____

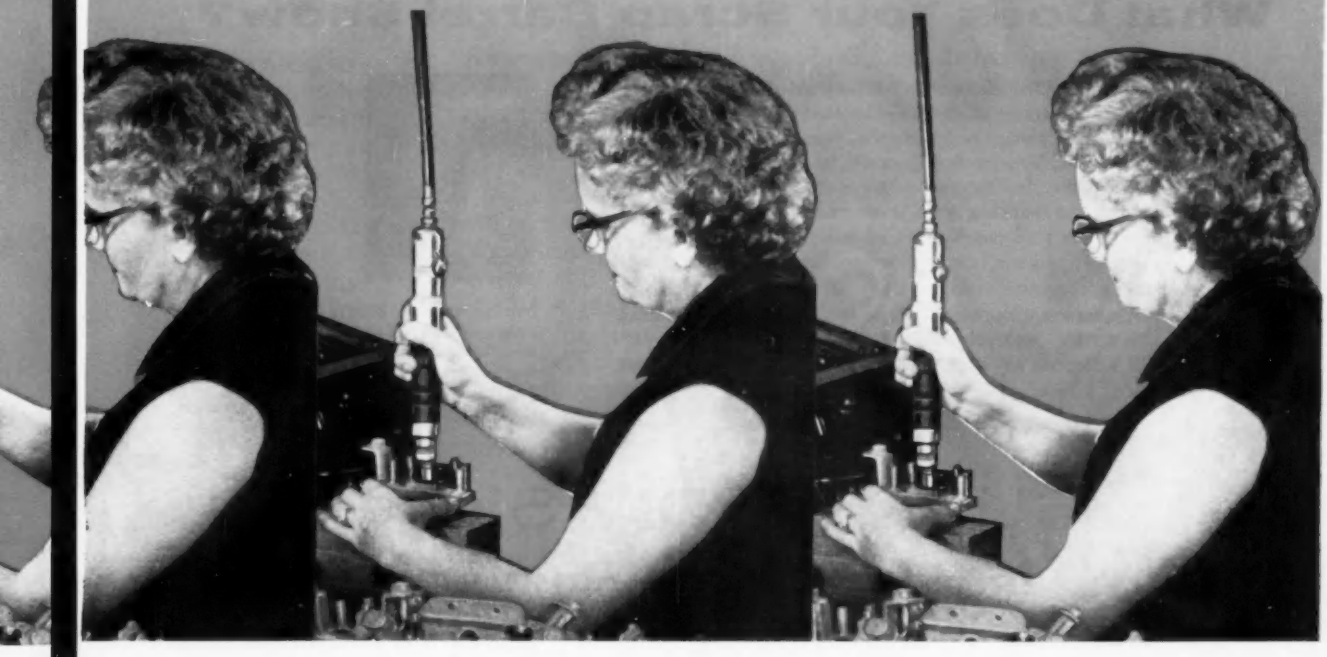
Company_____

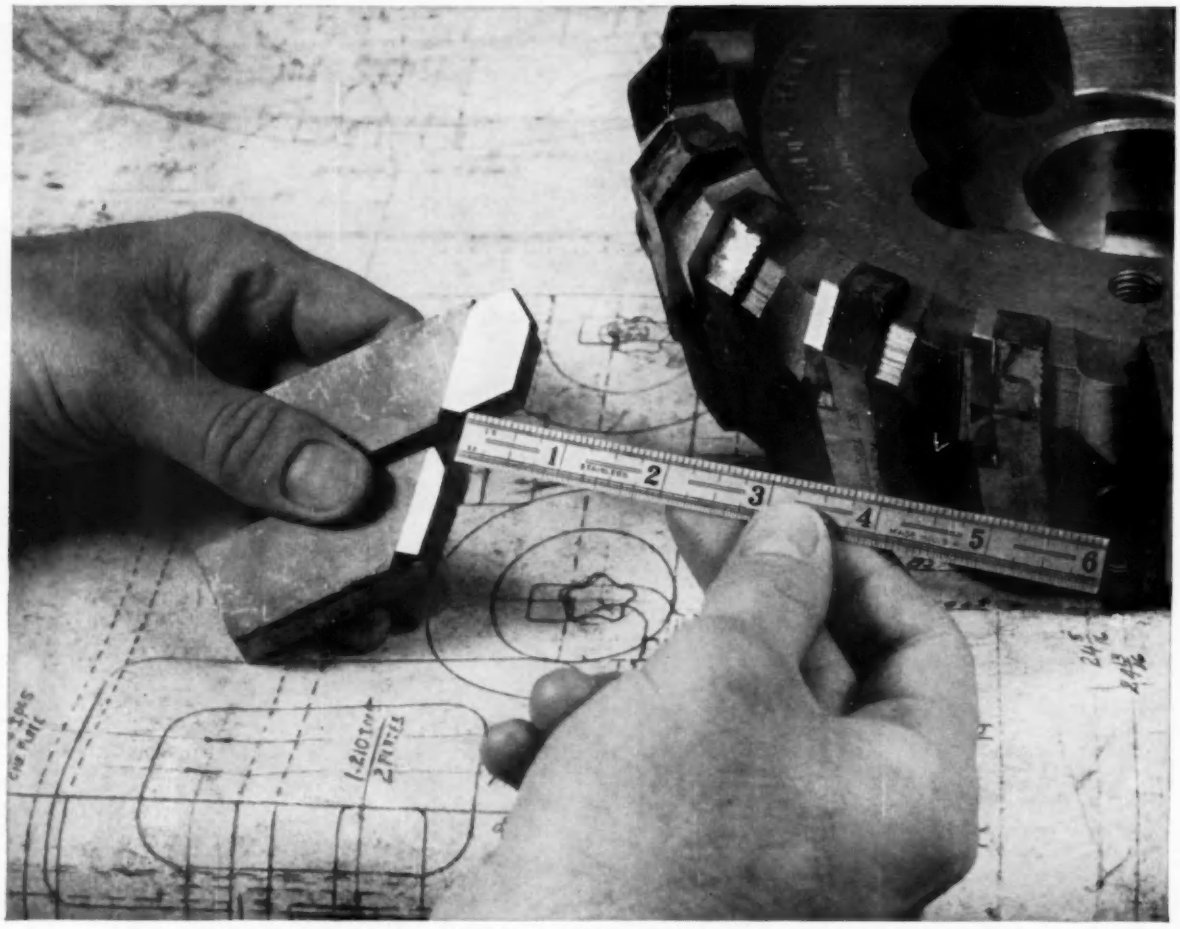
Address_____

City_____ Zone____ State_____

Chicago Pneumatic

Pneumatic Tools • Air Compressors • Electric Tools • Diesel Engines • Rock Drills
Hydraulic Tools • Vacuum Pumps • Aviation Accessories





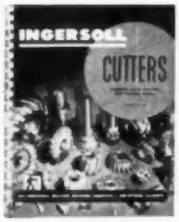
Ingersoll Heavy-Duty Shear Clear Face Mill designed for cast iron or steel. Size of bevel is varied to suit depth of stock.

What Does Your Scrap Barrel Show?

Do you get over ½" of blade wear? A look into your scrap barrel will show that many blades were wasted because of cracks, misuse, improper design or misapplication of the cutter and grade of carbide. You probably can't tell why these blades failed prematurely because so many variables are involved.

We are used to working with these variables and can help you reduce your tool costs. Part of our product is the continuous counsel of your Ingersoll representative and our cutter engineers. They will consider the machine, material, speed, feed and finish requirements before recommending the tool which will do the best job at the lowest cost.

We will welcome an opportunity to tell you more about this service. Write:



If you do not have a copy of this book, write us and we will send you one. It describes in detail the complete line of Ingersoll inserted blade milling and boring tools. Ask for Catalog #661

CUTTER DIVISION

THE INGERSOLL MILLING MACHINE COMPANY

505 FULTON AVENUE — ROCKFORD, ILLINOIS

XXVII

This is the twenty-seventh of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Cold-Finishing of Alloy Steels: The Effect of Cold-Drawing

The cold-drawing of alloy bars was discussed in the advertisement prior to this one, No. XXVI in the series. Here, we continue with a general explanation of the effect of cold-drawing.

During the cold-drawing process, certain changes take place in the steel structure, and in mechanical properties. There is a slight increase in tensile strength, compared with a substantial increase in yield point, and a decrease in ductility. These properties enable the production of small parts which require the greater strength necessary for certain automatic-machine forming operations, and a machine finish superior to hot-rolled material. Naturally, the beneficial effects of alloy steels are attained in the subsequent heat-treatment of parts.

The process of cold-drawing results in bars which are free from scale, accurate to shape, and within close tolerances. These conditions are ideal for automatic machining, as the elimination of scale is conducive to long tool life, and the accuracy of shape and close tolerances permit the bars to pass freely through the feed mechanism of the "automatic." Moreover, the cold-drawn finish and tolerances may be such that machining can be eliminated in some areas of the finished part. For example, sparkplug shells are produced from hexagon bars which require no machining on the hexagon sections.

Continuous roller hearths and car-bottom furnaces of both standard and controlled-atmosphere types, are used for special treatment of alloy bars before cold-drawing. Thermal stress-relieving can be used to reduce residual stresses in the steel caused by the cold-drawing process, wherein the mechanical properties will be altered depending upon the temperature used.

If you would like more specific details about the chemical composition or mechanical properties of cold-drawn alloy bars, and the results that can be expected, by all means consult our technical staff. Bethlehem metallurgists will gladly help you work out any problem, without cost or obligation on your part.

In the next advertisement, No. XXVIII in this series, the second category in cold-finishing will be discussed, i. e., the turning and grinding of alloy steel bars.

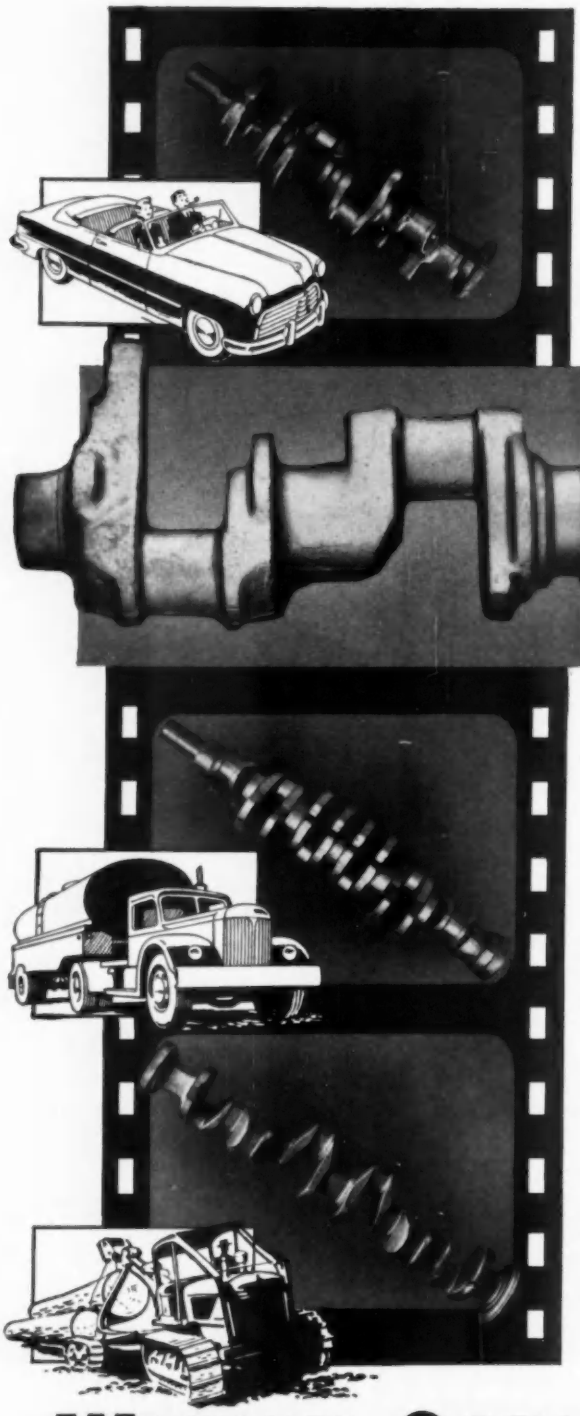
Remember that Bethlehem produces a wide and complete range of cold-drawn alloy steel bars in rounds, hexagons, squares, or flats, in standard, odd, decimal or metric sizes required, as well as special sections. Bethlehem also makes the full range of AISI standard alloy steels, and special-analysis steels and all carbon grades.

If you would like reprints of this series of advertisements from No. I to No. XXVII, please write to us, addressing your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. The first 27 subjects in the series are now available in a handy 40-page booklet, and we shall be glad to send you a free copy.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL



There's no substitute for the FORGED crankshaft

Crankshafts have been made successfully by other methods of fabrication and have proven to be *good enough* for certain non-critical applications—but for maximum dependability of the modern, compact, high compression, high torque engine a forged crankshaft is essential.

The forging process assures, to the greatest degree possible, uniformity and predictability of physical properties with a minimum variance from piece to piece or from one location to another in the same piece.

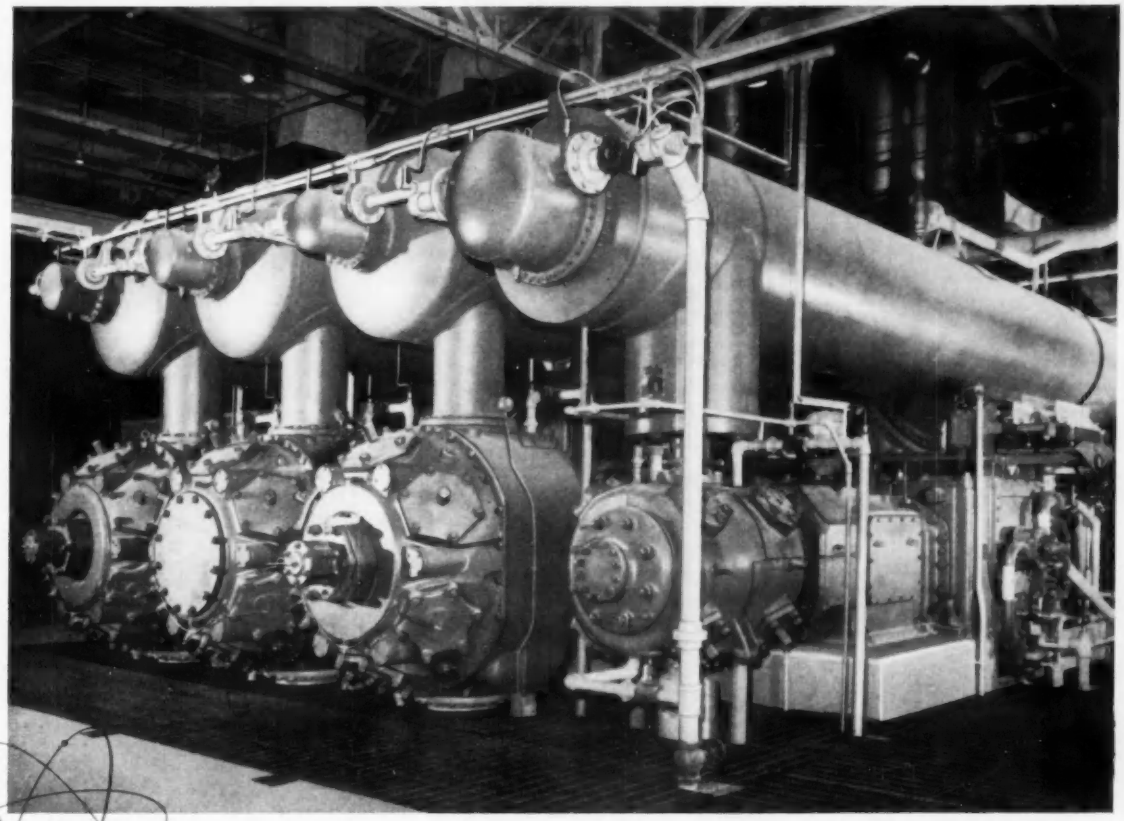
Wyman-Gordon has been forging crankshafts since the beginning of the internal combustion engine era and today produces more crankshafts for a greater variety of applications than any other company in the world. In a crankshaft there is no substitute for a forging, and in a forging there is no substitute for Wyman-Gordon quality and experience.

WYMAN-GORDON COMPANY

Established 1883

WORCESTER 1, MASSACHUSETTS
HARVEY, ILLINOIS • DETROIT, MICHIGAN

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM



Two Clark CLBA-8's serve in connection with the Engineering Test Reactor designed and built by Kaiser Engineers, Oakland, Cal., for the AEC's National Reactor Testing Station at Idaho Falls, Idaho.

In ATOMIC ENERGY too, Clark Compressors Are Giving Rugged, Reliable Service

Designed to perform engineering tests on fuel elements and components of nuclear plants, the Engineering Test Reactor provides large experimental facilities which supplement research reactors already in use.

Serving a major experiment in this reactor are two Clark CLBA-8 compressors, rated at 4,500 bhp. each. With a capacity of 15 pounds per second, they are operating at a discharge pressure of 320 psig. A 13-step combination automatic and manual pressure control allows varying discharge pressures from 50 to 350 psig.

These CLBA-8's, built on the Clark-originated balanced/opposed principle, provide maximum power on less fuel in minimum space. Their field service records in a wide range of applications attest to their high efficiency, economy of operation, and low installation and maintenance costs.

The Clark encyclopedia of experience—in design, manufacture, and application—is always at your service. For complete information on all Clark balanced/opposed compressors, call your nearby Clark engineer. Or write today for the new Composite Catalog, Clark Bros. Co., 2207 Lincoln Avenue, Olean, N. Y.

CLARK BROS. CO.

One of the Dresser Industries

Sales and service outlets in principal cities throughout the world

CLARK®

BALANCED / OPPOSED COMPRESSORS

CALENDAR

OF COMING SHOWS AND MEETINGS

International Automobile Show, N. Y. Coliseum, New York, N. Y. .....Apr. 5-13

SAE Aeronautic Production Forum and Aircraft Engineering Display, Hotel Commodore, New York, N. Y. .....Apr. 8-11

American Zinc Institute, annual meeting, Chase-Park Plaza Hotels, St. Louis, Mo. ....Apr. 14-15

Lead Industries Association, annual meeting, Chase-Park Plaza Hotels, St. Louis, Mo. Apr. 14-15

Design Engineering Conference, International Amphitheatre, Chicago, Ill. .....Apr. 14-17

American Welding Society Show and annual technical meeting, Kiel Auditorium and Hotel Statler, St. Louis, Mo.....Apr. 14-18

Institute of Environmental Engineers, second annual meeting, Hotel New Yorker, New York, N. Y. .....Apr. 17-18

National Industrial Health Conference, Convention Hall, Atlantic City, N. J. .....Apr. 19-25

Metal Powder Association, annual meeting, Sheraton Hotel, Philadelphia, Pa. .....Apr. 21-23

U. S. Chamber of Commerce, annual meeting, Washington, D. C. Apr. 27-30

Westinghouse 1958 Machine Tool Forum, Hotel Statler, Buffalo, N. Y. .....Apr. 29-30

National Screw Machine Products Association, annual meeting, Drake Hotel, Chicago, Ill. Apr. 30-May 3

American Society of Tool Engineers, annual meeting and tool show, Convention Hall, Philadelphia, Pa. .....May 1-8

Western Regional Material Handling Show, Great Western Exhibit Center, Los Angeles, Calif. .....May 8-10

American Society for Metals, Southwest Metal Exposition and Congress, Dallas, Tex.....May 12-16

Society for Experimental Stress Analysis, spring meeting, Hotel Manger, Cleveland, O.....May 14-16

National Truck, Trailer and Equipment Show, Great Western Exhibit Building, Los Angeles, Calif. .....May 15-18

Society of Aeronautical Weight Engineers, Inc., Belmont Plaza, New York, N. Y. .....May 19-22

American Foundrymen's Society, 1958 Foundry Show, Cleveland Public Auditorium, Cleveland, O. .....May 19-23

International Federation of Automobile Engineers and Technicians, International Technical Congress, Paris, France..May 19-28

Indianapolis Race, Indiana .....May 30

Now Firestone ...

and fashionized aluminum

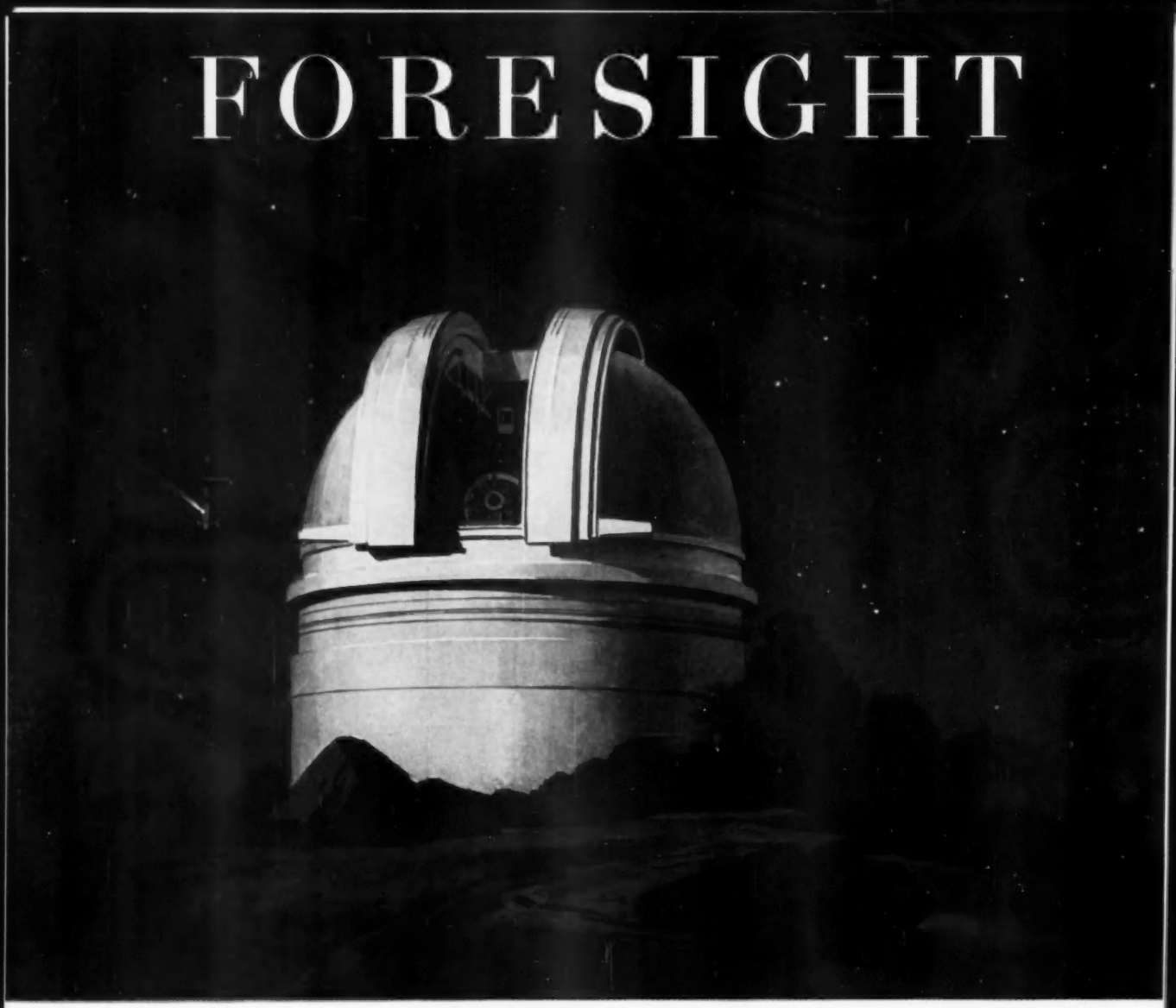
An established supplier to the automotive industry for nearly 50 years ... now fabricating parts from light, strong, rust-free ALUMINUM

Aluminum truly has become the designer's metal . . . and that's why Firestone Steel Products Company has turned to this modern metal that's synonymous with fashion.

Today, aluminum grilles and other parts for 1958 model cars, as well as colorful bright-work for household appliances, are being produced in Firestone's modern, efficient, expanded plants that provide the most complete facilities for fabricating and color-finishing (fashionizing) aluminum. Aluminum tailored and tinted to the most exacting specifications. Aluminum mass-produced in sizes up to seven feet long. Firestone's color-anodizing line is the most modern . . . is fully automatic and is one of the largest in the industry today.

The finest quality aluminum mill products and the services of aluminum specialists complement Firestone's proved record for skilled engineering and production in integrated contract fabricating.

FORESIGHT



Planning for tomorrow • Producing for today!

Since the earliest days of the industry, Bendix foresight in product design and development has contributed materially to automotive progress.

For example, Bendix* power braking and power steering, two of the industry's most popular new car features, are the results of years of research and engineering by Bendix specialists in these important fields.

Today Bendix engineers are likewise busy planning and developing new and better products to meet the needs of the years ahead.

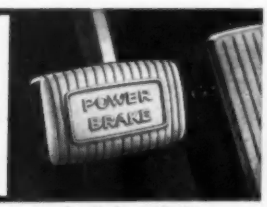
It is because of this foresight the automotive industry looks to Bendix for components that continue to lead in public acceptance and dependable performance.

*REG. U.S. PAT. OFF.

BENDIX PRODUCTS DIVISION **SOUTH BEND** INDIANA

Export Sales: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

TYPICAL EXAMPLES



Bendix Power Brakes

Bendix Power Steering

Bendix Products Division

Bendix AVIATION CORPORATION

BRAKES • POWER STEERING • POWER BRAKING • CONSTANT VELOCITY UNIVERSAL JOINTS • HYDRAULIC REMOTE CONTROLS

AUTOMOTIVE INDUSTRIES

BUSINESS DEPARTMENT

John C. Hildreth, Jr., Publisher
John F. Pfeffer, Asst. to Publisher
E. H. Miller, Advertising Mgr.
E. W. Hevner, Circulation Mgr.
James Cadagan, Asst. Circulation Mgr.

REGIONAL MANAGERS

CHICAGO—William H. Baldwin
—Carl A. Zehner
360 North Michigan Ave.
Chicago 1, Ill.
Phone RAndolph 6-2166

DETROIT—Melvin B. Nylund
103 Pallister Ave.
Detroit 2, Mich.
Phone TRinity 3-7800

PHILADELPHIA and NEW YORK—
Nelson W. Sieber
Chestnut and 56th Sts.
Philadelphia 39, Pa.
Phone SHerwood 8-2000
and
100 East 42nd St.
New York 17, N. Y.
Phone OXford 7-3400

NEW YORK—Robert P. Hulbert
100 East 42nd St.
New York 17, N. Y.
Phone OXford 7-3400

CLEVELAND—Richard P. Keine
930 B. F. Keith Bldg.
Cleveland 15, Ohio
Phone SUperior 1-2860

DALLAS—William J. Smyth
909 Mercantile Securities Bldg.
Dallas 1, Tex.
Phone Riverside 7-1732

TULSA—John W. Sangston
621 Petroleum Bldg.
Tulsa, Okla.
Phone LUther 4-1769

SAN FRANCISCO—Frank W. McKenzie
1355 Market St.
San Francisco 3, Calif.
Phone UNderhill 1-9737

LOS ANGELES—L. H. Jackson
198 S. Alvarado St.
Los Angeles 57, Calif.
Phone DUnkirk 7-4337

●

One of the Publications
Owned by

CHILTON COMPANY

Executive Offices
Chestnut & 56th Sts.
Philadelphia 39, Pa., U.S.A.

High Spots of This Issue

▼ Ford's New Diesel Tractor Engine

Economy in production has been achieved in Ford's new Diesel tractor engine by redesigning some components of the gasoline four-cylinder tractor engine so that many of its parts could be used for a Diesel engine. The Diesels, described here, are made on the same machining and assembly lines as the gasoline and LP-gas tractors. Page 60.

▼ Testing for Leaks in Air Suspension Systems

A description of a leak detection system using nitrous oxide, a non-toxic and stable gas that is readily measured in the infrared portion of the spectrum as the tracer material is contained in this article. The system gives both a visible and audible indication of a leak. Page 61.

▼ Friction Materials

A review of the factors to be considered in the selection of a suitable friction material, which is a prime element influencing the ultimate power, weight and operational limits of automotive vehicles, is presented here. Page 62.

▼ Small Dutch Car With V-Belt Drive to Rear Axle

The DAF car is the first venture in the small car field by Van Doorne's Fabriek. This article includes a description of the automatic "Variomatic" transmission which employs V-Belts in transmitting power to the 12 in. rear wheels. Page 71.

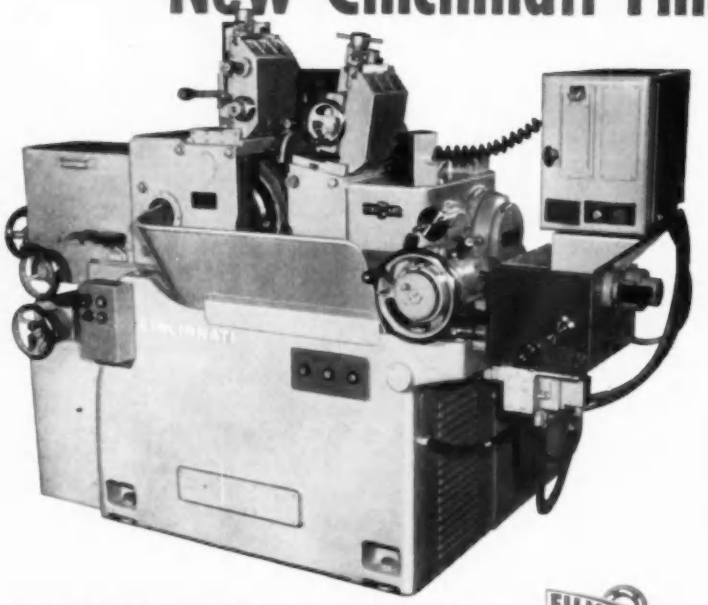
▼ Preview of Design Engineering Show

More than 20,000 visitors are expected to attend the third Design Engineering Show in Chicago's International Amphitheatre April 14-17. It will occupy about 125,000 sq ft of floor space with some 400 of the nation's manufacturers displaying vital components. Page 73.

▼ 40 New Product Items And Other High Spots, Such As

Air suspension systems; Continental's new laboratory; Lincoln power steering; GM automatically guided car; SAE national meeting; and industry statistics.

New Cincinnati Filmatic No. 1



CINCINNATI FILMATIC No. 1 Centerless Grinding Machine, with Crush Truing Attachment and Electro-Hydraulic Automatic Infeed Attachment. Catalog No. G-703.

Top Performer in Centerless Grinding Small Parts, *including Accurate Form Work requiring Crush Trued Wheels*

Crush truing unit, with cover removed. Crushing rolls are cartridge mounted for setup convenience. Motor mounted on the bracket drives the rolls for regrinding them, while an auxiliary motor supplies the slow speed required for effective wheel crushing. Diamond wheel truing unit is mounted on top of wheel guard.

Everyone concerned with quality and costs will be delighted with the performance of new CINCINNATI FILMATIC No. 1 Centerless Grinding Machines. They are built for precision infeed and thrufeed work, and can be equipped with a variety of production attachments, **including crush truing.** Highlights of design and how they contribute to top performance include:

Exclusive FILMATIC grinding wheel spindle bearings... over 99% of these bearings on all CINCINNATI Grinding Machines have never required service

Swivel mounted regulating wheel unit . . . reduces setup time

Automatic and oil shot lubrication

Engineered electrical controls . . . enclosed and protected from damage and tampering

In addition, Cincinnati has a selection of 19 attachments, such as graduated axial spindle adjustment, Electro-Hydraulic automatic infeed, grinding wheel spindle reciprocation, crush truing, and others. ¶Your centerless grinding equipment for work within 1½" diameter range can now be profitably replaced with new CINCINNATI No. 1's. Our Engineering Service Specialists, the world's most experienced in tooling up centerless grinders, are ready to help. Get a good start by asking for catalog No. G-703.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI®

CENTERTYPE GRINDING MACHINES • MICRO-CENTRIC GRINDING MACHINES
CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

News

OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 118, No. 7 **April 1, 1958**

Greater Use of Static Control Seen in Automobile Industry

An expanding use of static control is foreseen in the automobile industry, particularly in multi-station automated operations.

AC Spark Plug Div., for instance, currently is completing the installation of a new static control machine—a machine with no moving parts in its control system. This will be the fifth such installation in little more than a year at AC's plant in Flint, Mich.

Another prime example of the trend is the new Ford Motor Co. automatic transmission plant at Sharonville, O., which will be in operation next summer. Some estimates place the amount of static control at Sharonville as high as 50 per cent of all control equipment.

The new unit at AC is a magnetized arm that will unload, transfer and reload air cleaner covers in a series of four Verson presses. AC expects the unit to be in operation either this month or in May.

Four other machines with General Electric static control already are in operation at AC. Static control has been applied to a magnet sorter, a crankcase breather assembly, a spark plug assembler, and a silk screen machine and oven loader.

At Sharonville, some 20 transfer machines made by at least seven machine tool builders are equipped with static control. There are also a number of smaller machines (grinders, etc.) with static control.

A static control welding press is in operation at Chrysler's Twinsburg, O., plant, and a similar installation is operating at Chrysler's Nine Mile press plant in Detroit.

Other recent static control installations are in use at Ford's Sterling plant, Fisher Body in Grand Rapids (press welder, stamping press), Cadillac in Detroit (millers, etc., on engine block line), Buick and Chevrolet manufacturing in Flint (presses).

At AC all of the systems are complete static control. Some larger installations, such as transfer machines, require relay circuit control for the final output to the machine function.

Basic advantage of static control is long life and greatly increased reliability. This means less maintenance and costly time loss.

The advantage is even greater in a multi-station operation such as AC's 16-station spark plug assembler, which has 130 magnetic-core logic elements, or the 32-station transfer machines going into the Sharonville plant. Some of the Sharonville machines have as many as 800 logic elements.

The logic element is a combination of input and output electrical control signals, and so it is the decision-making portion or "brain" of static control.

In fact, Westinghouse likened static control to human brain functions when it drew on the word "cybernetics" for the company's trade name for static, Cypak. (Cybernetics is the comparative study of human and electro-mechanical control functions.)

Although new to machine tool operation, logic elements are widely used in telephone relay circuits and computers.

SUNBEAM RAPIER HAS RESTYLED BODY

Latest Sunbeam Rapier four-passenger sports sedan is made in Britain by the Rootes Group. It has a twin-carburetor engine with capacity increased to 91.2 cu in. that develops 73 bhp at 5200 rpm. Maximum torque is 81 lb/ft at 3000 rpm. The four-speed transmission has a stick shift on the floor, and overdrive is available as an optional extra. The restyled body, available as either hardtop or convertible, is of unitary construction.

Chrysler Veep Keller Resigns; Was Head of Engine Division

Chrysler Corp. vice-president Robert T. Keller has resigned to devote "more time to other business interests."

Mr. Keller was a corporation vice-president since May, 1953, and prior to that he was vice-president of the Marine and Industrial Engine Div.

NEWS AUTOMOTIVE AND AVIATION

AUSTIN GYPSY HAS ALL-INDEPENDENT SUSPENSION

Four-wheel drive Austin Gypsy is claimed to be the first vehicle with all-independent suspension using trailing arms sprung on bonded rubber cylinders. Spring failure is said to be virtually impossible in normal cross-country use, and destruction tests have shown a life three times that of ordinary leaf springs. Differentials are rigidly mounted to the tubular chassis, and drive is through an eight-speed transmission. Gas or Diesel engines of 128 cu in. displacement are optional power units.

Chrysler Lists Developments In New Heat Treat Techniques

Chrysler Corp. credits new heat treating techniques at its Kokomo, Ind., automatic transmission plant for time and cost economies, improved quality control and increased plant safety.

Key factors in the Kokomo system are integration with machining operations, suspended carburizing, hot oil quenching, and electro-mechanical control.

Some of the methods developed for the Kokomo plant now are being tried at other Chrysler Corp. manufacturing plants.

The machine line at Kokomo was laid out around the heat treat operation, so that the carburizing furnaces form an integral part of the production line. Four continuous pusher type furnaces, each with three rows, are located at a single point across the line.

Rough-machined parts are fed directly to the furnaces and then passed on to finish machining. This unbroken flow results in a minimum of handling and time loss. Also, there is no storage problem connected with heat treating because of this sequence.

The furnaces are surrounded by fireproof curtains, and roof ventilation keeps the adjacent work areas cool and gas-free.

Because of this close integration of heat treating and machining operations, Chrysler engineers found it necessary to devise a system of suspending carburizing while the production line was down. A method of halting the process in the midst of a cycle was developed, so that operations can be suspended for third-shift, holiday, or weekend shutdown.

For suspension, temperature in four of the five furnace zones is cut from the 1700 F operating temperature to 1350 F. Temperature in the discharge zone is reduced to 1425 F, allowing a safe margin for ignition.

All methane additions are discontinued and endothermic atmosphere is introduced to protect parts remaining in the trays during suspension.

To resume carburizing, the temperature and gas chemistry are brought back to normal approximately 2 hours before the line starts up again. Chrysler engineers say scheduling at Kokomo is made easier and more accurate because of this method of suspending carburizing.

The plant has eliminated quenching presses—all quenching is done in hot oils at 350 F, with some intermediate oils of 200 to 300 F. Quenchant oil flows at velocities of up to 8000 gal per minute and is directed by a series of baffles to ensure complete coverage.

According to Chrysler, the use of hot oil marquenching without quenching presses and dies provides a minimum of distortion and a maximum of quality control.

Chrysler is experimenting with suspended carburizing at its Indianapolis transmission plant and at the Lynch Road manufacturing plant in Detroit. At the Detroit plant the problem is somewhat different than at Kokomo because the carburizing cycles run from 9 to 13 hours. Varying temperature and methane adjustments are used here.

Hot oil marquenching also is done at Indianapolis and, to a limited extent, in Chrysler's Highland Park, Mich., plant.

International Nickel Develops New Electrorefining Process

A new process for the electrorefining of nickel that permits recovery of elemental sulphur and selenium has been developed by research scientists of International Nickel Co. of Canada, Ltd.

The new Inco process features the direct electrolysis of nickel matte, thereby eliminating high-temperature oxidation and reduction operations. Instead of the usual electrorefining methods in which a metal anode is used, nickel sulphide can be cast directly into sulphide anodes and electrolyzed to produce high-quality nickel.

Another unique feature of the process, the company says, is that it permits for the first time in nickel refining, the commercial recovery of elemental sulphur and selenium, in addition to cobalt and precious metals previously recovered. Sulphur-selenium separation is accomplished in a 100-ft-high fractionating column of special design.

The process is now in commercial operation in a section of the company's Port Colborne, Ont., nickel refinery.

Contract Talks Get Under Way Between Union and Big Three

Negotiations on new contracts between the United Auto Workers union and Ford, Chrysler and General Motors are under way, with preliminary talks on such issues as recognition of bargaining teams, ground rules, local problems and other curtain-raisers.

Three or four months ago it ap-

peared that 1958 would be a year of a major automobile strike, but the overall picture is now considerably altered. For one thing, the UAW's position is not as clear-cut. The short-week was replaced in January by a profit-sharing plan, but the profit-sharing idea did not capture the solid support that was hoped for by the union's top leadership.

Widespread layoffs in recent months have weakened the UAW's ranks. There are fewer dues-paying members than there were last December 1, and smaller paychecks for some production workers.

An indication might be seen in a recent strike vote at Fisher Body Div.'s plant at Pontiac, Mich., where the membership voted not to approve a grievance strike. This particular local historically has tended to vote in favor of striking.

A basic wage increase is probable, as well as improvements in Supplemental Unemployment Benefits.

There is still a possibility—although not presently a strong one—that the current contract might be extended for another year or two. This would give annual automatic increases averaging between 6 and 7 cents an hour.

American Motors' contract expires June 15 and Studebaker-Packard's runs until Aug. 31. Although it does not appear that any of the five automobile manufacturers will bargain together, the pattern for settlement will be similar, as in the past.

Thunderbird Comes Off Line As Ford's 50 Millionth Vehicle

A 1958 Thunderbird, green in honor of St. Patrick's Day, was driven off the assembly line last month as Ford Motor Co.'s 50 millionth vehicle since Henry Ford's first production gas buggy was built in 1903.

The new T-Bird was built at one of the newest Ford factories, the single-unit plant at Wixom, Mich., where Lincoln, Continental and Thunderbird are produced.

It took Ford 55 years to build its first 50 million units. A company spokesman predicted recently that the next 50 million will be built in less than 25 years.

Bendix Aviation Predicts Drop In Sales, Earnings This Year

Bendix Aviation Corp. predicts its sales and earnings will drop during the current fiscal year, although the decline is viewed as "short term."

Sales during the first quarter, which ended last Dec. 31, rose slightly while earnings dipped. But the company's backlog of unfilled orders dropped from $526 million at the beginning of the current fiscal year to approximately $422 million at present.

Factors contributing to the drop in the order position, according to the company, have been a decline in automotive production, reduced military and defense production, cutbacks in industrial capital expenditures and the switch in emphasis to research on missiles instead of manned aircraft.

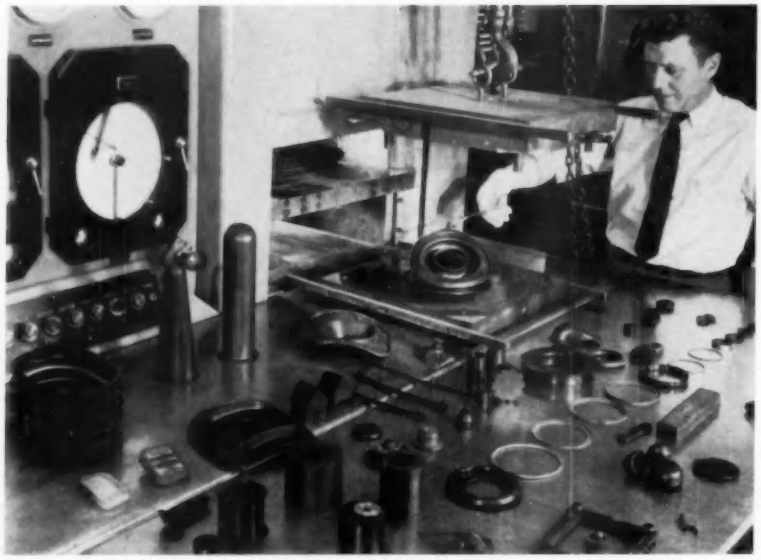
DIAMOND T INTRODUCES NEW TILT-CAB DIESEL

Diamond T's new tilt-cab Diesel built to handle 18-22 tons will find its greatest application as a highway tractor, the company says. GCW rating of the vehicle is 60,000 lb with standard rear axles and 65,000 with optional oversize rear axles. The aluminum cab is counterbalanced and tilts manually without the aid of disconnections, hydraulic devices or plumbing. Controls are mounted on a rigid section of the floor and are not disturbed when cab is tilted. Power plant is the new Cummins NH-180 Diesel, which develops 180 hp and maximum torque of 450 lb/ft. Piston displacement is 672 cu in.

FIRST SCOTSMAN PICKUP TRUCK ROLLS OFF ASSEMBLY LINE

First new 1958 Studebaker Scotsman half-ton pickup is shown rolling off assembly line at South Bend, Ind. Vehicle is powered by Studebaker Work Star 185 six-cylinder engine, which develops 92 bhp at 3800 rpm and maximum torque of 152 lb/ft at 1800 rpm, and has a compression ratio of 7.5 to 1. It is mounted on a 112-in. wheelbase and is rated at a maximum GVW of 4800 lb. Advertised delivered price is $1595 at South Bend.

News AUTOMOTIVE AND AVIATION



Hydraulic press turns out experimental parts at Chrysler

Miniature Plant Produces Experimental Rubber Parts

Chrysler's miniature rubber plant is a complete little package—everything required to produce rubber parts in a room 30 by 35 ft.

The plant has all the necessary equipment, from a mixing machine one-hundredth the size of a production machine to a mill one-tenth standard size and an extrusion machine about one-sixth the size of its production counterparts.

Chrysler uses the miniature factory to produce some 15,000 experimental parts each year. Of the parts that are not rejected, some are marked for future developments and some are approved for current production or for coming models. Chrysler is able to produce rubber parts, from mixing to molding, in less than two hours.

Engineers and technicians are able to produce experimental parts anywhere from a week to three months faster than outside suppliers. Chrysler also calls on approximately 180 outside rubber suppliers for experimental as well as production parts.

Four New Industrial Engines Are Announced by Ford Div.

Ford Div. has added four new industrial engines to its line, bringing to ten the number of gasoline and Diesel engines offered by the division for mobile and stationary use.

The line now ranges from 134 to 534 cu in. in displacement.

The new engines include the 401, 477, and 534 cu in. V-8 gasoline engines and the 330 cu in. 6-cylinder Diesel.

The three gasoline engines feature high-turbulence wedge-shaped combustion chambers, a new fuel induction system, and a new fuel pressure lubrication system.

Dished-type valves are faced with tungsten cobalt alloy. Valve rotators were standard equipment and tungsten cobalt alloys are used on both intake and exhaust valves. The stem of the exhaust valve is sodium filled for better heat transfer and life.

Compression ratio of all three gasoline engines is 7.5 to 1. The 534 develops 252 bhp at 2800 rpm, with a torque rating of 492 lb/ft at 1700-2200 rpm. For the 477, bhp is 226 and torque rating is 431 lb/ft at 1700-2400 rpm. The 401 has a bhp rating of 185 and torque of 351 lb/ft at the same speeds.

The 330 cu in. Diesel is Ford's second industrial Diesel. A four-cylinder 220 cu in. model was introduced in 1956.

The new 330, with a 12-volt electrical system, has four-way fuel injectors, replaceable cylinder sleeves, and overhead exhaust valves designed to rotate each time they open and close. The 330 has a compression ratio of 16 to 1 and bhp for the complete engine assembly of 96 at 2250 rpm. Torque rating is 236 lb/ft at 1600 rpm.

All of Ford's industrial engines are built at the Ford Highland Park plant near Detroit.

S-P Banking on Spring Sales To Improve Profit Picture

Studebaker-Packard Corp. is banking on a spring upturn in automobile sales to improve the company's financial status. S-P recently reported a net loss of $11,135,108 during 1957.

Production during most of 1958 has been on an alternate week basis, but by mid-March the company saw an improvement in dealer orders and hoped to be able to schedule three consecutive weeks of production. Through mid-March, total production was only about one-third of 1957 production for the same period.

The $11 million loss in 1957 was on sales of $213,203,741 compared with sales of $303,038,430 the year before. In 1956, however, losses totaled $43,318,257 prior to a special charge of $60 million for inventory obsolescence and costs involved in transferring Packard production to South Bend.

Year-end adjustments offset an operating loss during the fourth quarter of 1957, so that an indicated profit of $1,230,581 was shown for the period. Sales, however, dipped from $75,672,386 a year ago to $65,772,191.

New Buick Safety Lock Keeps Children in Place

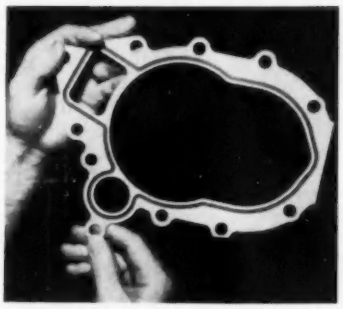
Buick two-door sedans now offer a safety lock to keep the back of the right front seat from flipping forward when the car makes a quick stop. The lock was designed primarily as additional protection for children riding in the back seat.

The seat back locks to the lower seat frame. A button releases the lock for easy access to the rear area.

Bound Brook Bearing Builds New Powder Metallurgy Plant

Bound Brook Oil-Less Bearing Company is building a new plant at Sturgis, Mich., for powder metallurgy fabricating. The $1 million plant, to be completed this year, will be geared to high-volume production of sintered bearings and parts.

The company also is modernizing and expanding its home plant in Bound Brook, N. J.



Gasket with Du Pont Viton molded in place

Du Pont to Produce New Fluorine Rubber

A new type of synthetic rubber, called Viton, which is capable of maintaining its strength and elasticity at temperatures above 400 F will be produced by Du Pont Co. at a plant now nearing completion at Deepwater Point, N. J.

The new material is an elastomer containing about 65 per cent fluorine by weight. No other commercial elastomer equals Viton in resistance to oils, fuels, and solvents at temperatures above 400 F, according to company spokesmen.

The largest single use for Viton to date has been for aircraft seals, the company said, but there is a growing interest in its use for such products as hose for fuels, protective clothing, wire insulations, brake cups, pump seals in automatic transmissions, fuel tanks for aircraft, aircraft tires, and portable storage tanks.

Du Pont reports that valve stem seals made of Viton are now being used on Ford Motor Co.'s new super duty truck engines, which have sodium-cooled exhaust valves that produce extremely high temperatures at the valve stem seal.

Viton will sell for $15 a pound, but the company expects to reduce the price as soon as additional process knowledge and facilities are developed.

Cincinnati Milling Forms A New Plastics Division

Cincinnati Milling Machine Co. has formed a division to produce machine tool covers and other structural shapes from Cimastra, a new glass-reinforced plastic developed by Cincinnati. The company expects to be in full production this quarter on Cimastra.

The new plastic is said to be cheaper and lighter than the sheet metal or cast iron often used for machine tool coverings, although it is not as prone to cracking and denting.

AI TABLOID

Westinghouse Electric Corp. has established a new applied research laboratory in Baltimore, Md., to develop advanced types of electron tubes, solid state devices, microwave tubes, and information storage tubes.

* * *

National Research Corp. received a Government contract for $460,000 to design, build, and test operate a quarter-ton-capacity vacuum "skull furnace" for melting titanium.

* * *

B. F. Goodrich Industrial Products Co. developed a new man-made rubber which is claimed to form a virtually impenetrable barrier to air and most other gases. A layer of the new rubber compound less than one-eighth in. thick stops air leakage at pressures as high as 3000 psi, the company says.

* * *

Midland-Ross Corp. acquired Hartig Engine and Machine Co., manufacturers of plastic extruding machinery.

* * *

Clark Equipment Co.'s Industrial Truck Div. purchased Lift Truck Rental Corp. and will operate it as a subsidiary called Clark Rental Corp., which will rent forklift trucks and other materials handling equipment in metropolitan New York, northern New Jersey, and Connecticut.

* * *

Standard Oil Co. (Indiana) research scientists report that the proper blend of motor oil can cut gasoline octane needs in new cars as much as six octane numbers. Among the unusual materials they tested in experimental additives were phosphorus, boron and titanium.

* * *

Micromatic Hone Corp. sold to Allis-Chalmers Mfg. Co. all machinery, equipment, inventories, and patents relating to Diesel fuel injection systems belonging to its Micro-Precision Div.

* * *

E. F. Houghton & Co. recently completed new plant and laboratory facilities in Detroit to expand its manufacturing potential for the local market.

B. F. Goodrich Co. reports that tests of Ameripol SN—described as the first man-made rubber with the same molecular structure as tree rubber—show that it can be used interchangeably with natural rubber for making high-speed truck, bus, military, and off-the-road tires.

* * *

Riverside-Alloy Metal Div. of H. K. Porter Co. is now using an English process for the continuous casting of copper alloys. The new method involves controlled pouring of molten metal and controlled solidification rates, resulting in extremely dense homogeneous composition.

* * *

North American Aviation, Inc. has developed a low-cost metal preservative, called Sabrex, which is now being used to protect tooling, machined parts, and temporarily stored machinery. Sabrex is a non-oxidizing wax-type material that dries in minutes and is claimed to protect from four months to a year.

* * *

Rockwell Spring and Axle Co. acquired Hydraulic Drives Dept. of Nuttall Gear Div. from Westinghouse Electric Corp. The transaction, for an undisclosed amount of cash, is subject to approval of directors of both companies.

* * *

Du Pont Co. is building a plant at Parkersburg, W. Va., for production of Teflon 100-X, a new fluorocarbon which may be extruded and molded into products such as insulated wire, electronic components, tubing, and linings for process equipment. The new plant is expected to be in commercial production by the middle of 1959.

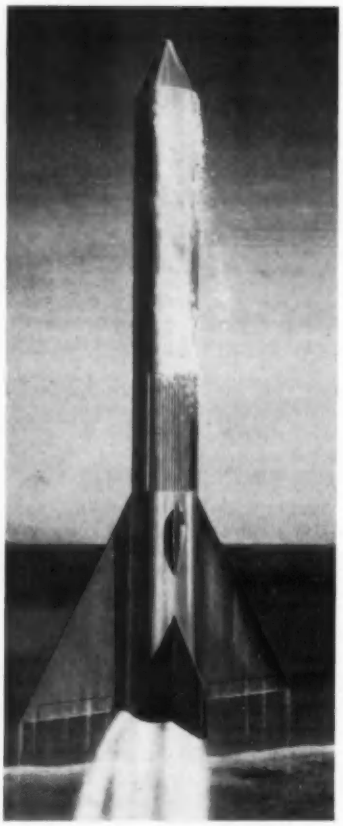
* * *

Walker Mfg. Co. plans to build a 140,000-sq ft plant at Aberdeen, Miss., for production of automotive exhaust pipes and tail pipes.

* * *

Auto Imports, Inc., west coast distributor of the Swedish-built Volvo automobile, has formed a truck division to handle the Volvo line of Diesel trucks in the U. S. and Canada.

AVIATION MANUFACTURING



Artist's sketch of non-stop space liner

Direct Flight to Moon Is Predicted by 1970

Controlled nuclear energy applied to space flight will enable men to make direct flights from the earth's surface to the moon and the closer planets by 1970, predicts a Convair official.

Krafft A. Ehricke, assistant to the director of Convair (Astronautics) Div. of General Dynamics Corp., described such a craft recently at the Jet Age Conference of the Air Force Association.

Preliminary designs call for a 200-ft, 90-ton, two-stage chemo-nuclear vehicle that he said would be capable of landing a 22,000-lb payload on the moon or orbiting a 30,000-lb payload around Mars. With a 15,000-lb payload, the vehicle could land a scientific expedition on the moon and have enough fuel remaining to take off, return to the edge of the earth's atmosphere, and transfer personnel to a reentry glider.

The bottom stage of the vehicle (see illustration) is a rocket-powered glider, fueled with gasoline and liquid oxygen; the pilot rides in an attached capsule that can be jettisoned for emergency escape.

Between glider and upper stage is a cylindrical adapter that holds the two sections together. Nested inside it at takeoff are a nuclear power plant and a gondola housing space crewmen.

Separation occurs after leaving the earth's atmosphere. The glider is detached to return to earth; the adapter structure and pointed low-drag fairing atop the upper rocket are jettisoned, and crewmen in the gondola start the nuclear rocket engine, which is fed on liquid hydrogen from the tanks.

Army Explorer Nose Cone Is Made of Stainless Steel

The nose cone of Army's Explorer satellite is made of stainless steel, according to details released by the Committee of Stainless Steel Producers on the cone's construction.

The Committee said that stainless steel was chosen because of its high-tensile strength and resistance to temperature extremes even in thin gages. Another desirable quality is its high corrosion resistance.

The nose cone used in the Explorer is 12 in. long and 6 in. wide at its maximum. The metal's thickness ranges from conical walls of .013/.017 in. to .094 in. at the middle of the blunt nose. Its weight before assembly on the rocket is 13 ounces, which is unusually light for its strength. Sixteen equally spaced holes, .125 in. dia are drilled around the cone's base for attachment to the instrument package,

The nose cone was manufactured by Lodge & Shipley Co. under contract to the Army Ballistic Missile Agency and the Jet Propulsion Laboratory.

Aerobee Research Rocket Is Successfully Tested

A new research rocket developed by Aerojet-General Corp. and designated Aerobee 100 was successfully tested at the Naval Ordnance Missiles Flight Test Facilities at White Sands Proving Grounds, New Mexico.

The Aerobee 100, which reached an altitude of 60 miles, is of simplified design and uses previous components of high reliability, the company reported.

Aerojet-General officials said the rocket was developed without Government support to meet the services' requirements for a vehicle which could transport a substantial instrument payload to the lower levels of the iono-

EXPLORER NOSE CONE

Stainless steel nose cone, similar to the one used in America's first earth satellite, is shown being tested by technician at Lodge & Shipley Co. He is using an ultrasonic probe for final testing of nose cone's wall thickness.

sphere (50 to 100 miles altitude).

The rocket is the newest product of the recently established Aerojet Systems Div., which also developed the propulsion system for the second stage of the Vanguard, the booster rocket for the Bomarc, and the Snort and Smart supersonic research sleds.

SAE N. Y. Meeting Features Talks on Advanced Aircraft

Methods of increasing output of advanced types of missiles and aircraft will be featured at the SAE 1958 National Aeronautic Meeting to be held in New York City's Hotel Commodore, Apr. 8-11.

Two full days, Apr. 8 and 9, will be given over to informal clinics of the Sixth Annual Production Forum, which is sponsored by Mundy I. Peale, president of Republic Aviation Corp. The forum will include a session on "Production Problems Peculiar to Missiles."

More than 50 technical papers are scheduled on such subjects as boron fuels, ion propulsion, rocket powerplants, turbine fuels and lubricants, high-temperature materials, Mach 15 flight, etc.

More than 60 manufacturers will participate in the Aircraft Engineering Display held throughout the meeting.

Arma Div. Gets AF Contract For Inertial Guidance System

American Bosch Arma Corp. has signed a $140,357,000 Air Force research and development contract for inertial guidance systems for the Titan ICBM.

Charles W. Perelle, president, said the signing represents the fixing of definite costs for the system's research and development, which began at the Arma Div. in 1955. So far about $51 million of the funds has been expended, with the remainder included in the company's current backlog of military orders, estimated at $165 million.

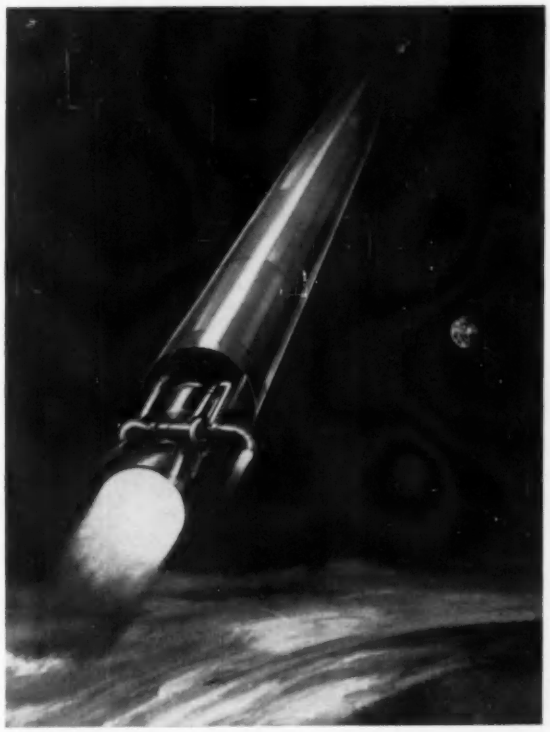
Convair Div. Announces Titanium Use in Atlas

Convair Div., General Dynamics Corp. has reported the first large-scale use of titanium in this country's ICBM program.

The metal—6 per cent aluminum, 4 per cent vanadium titanium alloy, produced by Titanium Metals Corp. of America—is being used in helium storage bottles which help control propellant flow into the combustion chambers of the Atlas ICBM.

NUCLEAR ROCKET ENGINE

Rocketdyne Div. of North American Aviation has received an Air Force contract for research on a nuclear rocket engine for space flight. Here is an artist's concept of such a nuclear rocket missile in flight to the moon. The reactor located in the combustion chamber would provide energy to convert fluid to ultra-high temperature gases. The gases, expanding through rocket nozzle, would attain enormous velocities, creates propulsive thrust several times greater than today's chemical rockets.



Convair officials said that titanium was used because of four factors—weight savings, low temperature properties, strength, and corrosion resistance.

Boeing Airplane Co. Reports Increased Sales and Earnings

Boeing Airplane Co. reported sales for 1957 totaling $1,596,508,515, and net earnings of $38,159,707.

Sales for the previous year were $1,006,356,748 and net earnings amounted to $32,134,989.

Net earnings, after taxes on income, were 2.39 cents per dollar of sales as compared with 3.19 cents the previous year.

The company attributes the reduced returns on sales to lower gross profit margins on incentive-type fixed-price contracts; higher interest rates; increased amortization charges, and the write-off of about $17 million of research, development, and general administrative expenses applicable to commercial expenses.

The company reported a backlog of $2,452,000,000 at year end, including $792 million worth of orders for commercial jet aircraft.

New B-52G Bomber to Carry Supersonic Guided Missiles

America's first heavy bomber to serve as a launching platform for supersonic guided missiles will be the new B-52G. First of the advanced Stratofortresses will roll from Boeing Airplane Co. production lines in Wichita, Kan., this summer.

The B-52G will be a launching platform for the "Hound Dog" guided missile, GAM 77, which is designed to carry a nuclear warhead "many hundreds of miles" beyond the bomber's turn-around point.

N. D. Showalter, Boeing vice-president and Wichita Div. general manager, said that the B-52G "will fly farther, strike harder and defend itself better than any other aircraft now flying. It will operate from altitudes above 50,000 ft."

Mr. Showalter said that a new fuel system and new type engines have greatly extended the bomber's range.

The B-52G is powered by Pratt & Whitney J57-P-43W engines.

Westinghouse Electric Installs Environmental Test Chamber

Westinghouse Electric Corp. has installed a new environmental test chamber at the company's Friendship Airport plant in Baltimore, Md.

The massive weather chambers can simulate an altitude of 90,000 ft and are capable of rapid temperature ranges from minus 105 to 500 F and humidity approaching 100 per cent—even with salt spray.

MEN IN THE NEWS

Borg-Warner Corp.—Harry P. Troendly was elected a group vice-president.

Westinghouse Electric Corp.—**Ronald N. Campbell** has been elected a vice-president of Westinghouse and president of its wholly owned subsidiary, C. A. Olsen Mfg. Co.

Sun Oil Co.—**Robert D. Park** was appointed manager of tires, batteries, and accessories (TBA) sales, succeeding **Robert H. Eastman,** who resigned.

United States Steel Corp.—**Boyd P. Doty, Jr.,** is now manager of sales in the Cleveland area, succeeding **James T. O'Connor,** retired.

Chevrolet Motor Div., General Motors Corp.—**Kai H. Hansen** has been made assistant director of the research and development department, and **Karl H. Jepson** is now head of the electrical and accessories group.

Joseph T. Ryerson & Son, Inc.—**Robert T. Stafford** was named general manager of the Seattle steel service plant, succeeding **W. R. Lockwood,** who was appointed manager of the machinery division.

Yale & Towne Mfg. Co., Yale Materials Handling Div.—**Gerald A. Tamblyn** was appointed sales manager of the new industrial tractor shovel line.

Dana Corp.—**Frank B. Graper** has been appointed manager of industrial account sales for the Standard Equipment Div.

Cincinnati Milling and Grinding Machines, Inc.—Carl F. Stugard was elected a vice-president.

Sundstrand Machine Tool Co.—Carl L. Sadler was elected vice-president in charge of Sundstrand Aviation Div., and Richard H. Olson was made vice-president in charge of the new Sundstrand-Turbo Div.

Baldwin-Lima-Hamilton Corp.—**William F. Boyle** was made general manager of the Hamilton Div., and **Ira M. White** was elected a vice-president and succeeds Boyle as general manager of the Pelton Div.

Alan Wood Steel Co.—**John T. Root** has been appointed advertising manager.

American Chemical Paint Co.—**Edward R. Krueger** was appointed technical sales representative for the metal-working chemicals division.

Phoenix Mfg. Co., Flange and Forging Div.—**Wilton O. English** has been named divisional manager.

Allis-Chalmers Mfg. Co.—**E. F. Greiwe** has become manager of the Norwood Works centrifugal pump department.

Babcock & Wilcox Co.—**Neil Robertson** has been named acting general traffic manager, manufacturing department, Boiler Div.

Young Spring & Wire Corp.—**T. W. Helwig** has been appointed group executive in charge of Daybrook Hydraulic Div. and Ottawa Steel Div.

Lipe-Rollway Corp.—Robert S. Root has been appointed chief engineer of both Clutch and Machine Tool Divs.

General Dynamics Corp., Convair Div.—J. V. Naish was elected president, succeeding Joseph T. McNarey, retired.

Campbell, Wyant and Cannon Foundry Co.—**David T. Martin** has become a member of the sales staff.

Norton Co.—**Joseph C. Danec** was appointed supervisor of sales of abrasive products for the masonry and concrete trades.

Engelberg Huller Co., Inc.—**James D. Kreager** has been promoted to sales manager of the Abrasive Machine Div.

Necrology

Raymond P. Fohey, 67, retired secretary of Chrysler Corp., died Mar. 4 at West Palm Beach, Fla.

Joseph E. Straub, 83, retired assistant vice-president in charge of production for Remington Rand Co., died Mar. 3, at Elmira, N. Y.

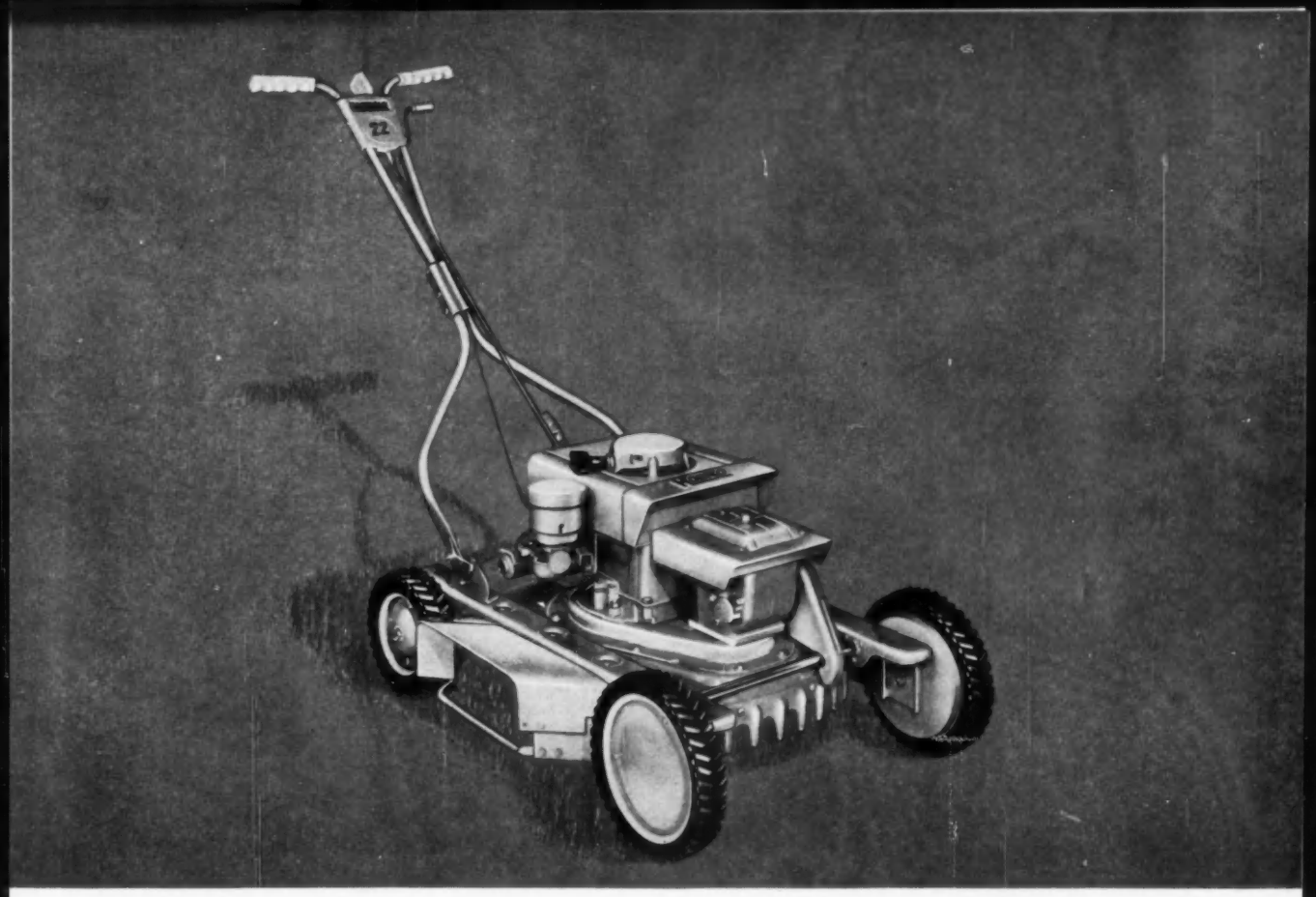
David McCulloch, 80, former board chairman and executive vice-president of Foster Wheeler Corp., died recently, at Stamford, Conn.

Frank L. Engstrom, manager of industrial sales for A. Schrader's Son, division of Scovill Mfg. Co., Inc., died recently.

George A. Rossney, 65, sales representative of Protective Coatings Div. of Pittsburgh Coke & Chemical Co., died Feb. 16, at Buffalo, N. Y.

James H. Hassall, a director and former treasurer of John Hassall, Inc., died Feb. 8.

Malcolm McCormick, 69, vice-president in charge of market research for Fram Corp., died recently, at Barrington, R. I.



Homko Thunderbird—Western Tool and Stamping Company's *all steel swept-line* power mower—mows without pushing. Engine drives blade and front wheel. Modern equipment like this demands modern protection. *All* Western power mower bearings are factory-lubricated with Texaco.

"Texaco helps keep our machining costs down, our output up"

says Plant Superintendent Lawrence Hancock, Western Tool and Stamping Co., Des Moines, Iowa.

"As the world's largest power mower producer, Western Tool and Stamping makes and sells 500,000 power mowers a year. There's no time for machine downtime. We get longer tool life, better finishes and fewer rejects with Texaco products," says Plant Superintendent Hancock.

Product	*Advantages*
Texaco Sultex Cutting Oil	assures longer tool life and better surface finish on hard-to-machine metals.
Texaco Soluble Oil	keeps grinding wheels and machining operations clean, remains stable in hard or soft water, allows dirt to settle out rapidly.
Texaco Regal Oil R&O	protects hydraulic circuits, prevents rust, sludge and foam.

Texaco Cutting, Grinding and Soluble Oils can improve your machining picture, too. Call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Visit Texaco at the Tool Show, Philadelphia, May 1-8 — Booth 2019

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Count on *Continental* to

meet special fastening problems

with specialized cost-saving experience

Continental Assembly Engineers' Specialized approach to fastener trouble-shooting assignments gets you the right answer promptly, with the biggest cost savings — for two reasons.

First, since Continental can supply more types of standard fasteners, from stock, their recommendations are unbiased. They can tell you if some "standard" you've overlooked will meet your needs.

Second, if a "special" is the best answer, you can rely on Continental's unlimited experience to design and produce a fastener that will meet all specifications at the lowest possible cost.

SPECIAL HOLTITE® PHILLIPS
button-head screw replaces two-piece fastening . . .

A bus builder asked Continental Assembly Specialists how to simplify installation of towel-holding buttons on back of bus seats. Separate wood screw and metal button being used caused slow work, with many pieces dropped and wasted.

One-piece button head special screw designed by Continental reduced parts cost 10%. Easy installation of simplified fastener provides much bigger saving in assembly costs.

COST LESS SPEED ASSEMBLY

HOLTITE® NYLOK®
self-locking screws solve problem of screws loosening in chain saw

When consulted by a chain saw maker on the problem of screws vibrating out, Continental Assembly Specialists had the answer in HOLTITE® NYLOK. Two of the several types of machine screws furnished, all fitted with the resilient nylon plug, are illustrated. These NYLOK screws do not loosen in spite of extreme vibration, keep the saws "on-the-job". Previous customer complaints of high maintenance costs were eliminated.

END COMPLAINTS OF HIGH MAINTENANCE COSTS

"Special" attention like this will pay off for you . . .

It costs you nothing to talk to a Continental Assembly Specialist. And, as soon as he digs into your problem, you'll see what we mean by "specialized experience". For prompt service, write or phone: Continental Screw Co., 451 Mt. Pleasant St., New Bedford, Mass.

MEMBER SCREW RESEARCH ASSOCIATION

CONTINENTAL

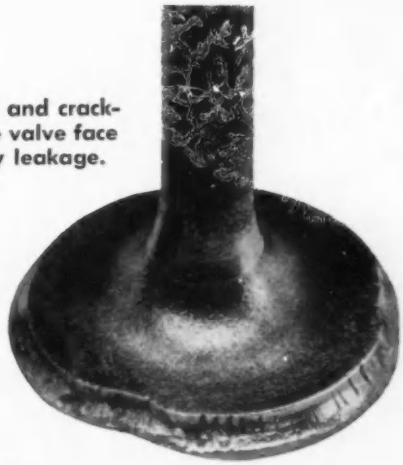
HOLTITE FASTENERS

HOLTITE PHILLIPS AND SLOTTED HEAD
WOOD • MACHINE • TAPPING • THREAD CUTTING • SEMS • NYLOK
HY-PRO PHILLIPS INSERT BITS AND HOLDERS

Eaton Valves are Solving Problems Like These–

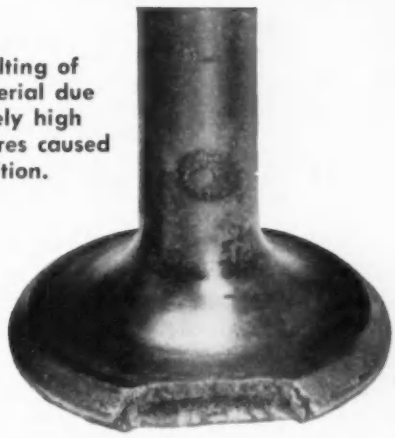
1. Broken valve due to overstressing.

2. Corrosion and cracking of the valve face caused by leakage.



3. Corrosion of the valve face due to sticking caused by stem and guide deposits.

4. Actual melting of valve material due to extremely high temperatures caused by preignition.



If you are having valve troubles, why not discuss them with Eaton Valve Division engineers. They will be glad to work with you in diagnosing the causes of failure, and in developing valves to meet the particular requirements of your engines and the kind of operation in which they are used. In hundreds of cases, Eaton engineers have been successful in suggesting measures which have corrected the most stubborn valve train problems. A study of your problem with complete technical report involves no obligation. Write, wire, or phone.

SODIUM-COOLED VALVES
•
SUPER-ALLOY VALVES
•
FREE-VALVES
•
FLEXIBLE VALVES
•
ALUMINIZED-HEAD VALVES

EATON

EATON
VALVE DIVISION
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN

RIVETT SQUAREMASTER "100" CYLINDERS

Unfailing POWER for MILLIONS of cycles!

Here's sure power for unfailing cylinder operation. SQUAREMASTER 100's are the world's finest constructed cylinders—perform with 100% efficiency! 200 P.S.I. air to 500 P.S.I. oil. Available in 7 mountings with standard dimensions, in 10 bore diameters, internal and external threading. Special models and cover combinations. Priced competitively; prompt delivery; meet all J.I.C. requirements.

RIVETT, INCORPORATED

Dept. AI-4, Brighton 35, Boston, Mass.

*Initial High Coefficient of Static Friction

POWER-PACKED FEATURES PROTECTED BY POWER-GUARD CONSTRUCTION

1. Piston rod. Ground and polished alloy steel. Hard chrome-plated. **2.** Piston rod bearing. Replaceable cartridge-type. **3.** Piston packing adjusts automatically. V-block packing minimizes friction. **4.** Correctly stressed tie rods. **5.** Cushion bushings. Bronze, floating type. **6.** Ports rotated to any 90° position. **7.** Steel covers. Take minimum mounting space.

Send for catalog. Proof of SQUAREMASTER efficiency stated in these 20 pages. Write today.

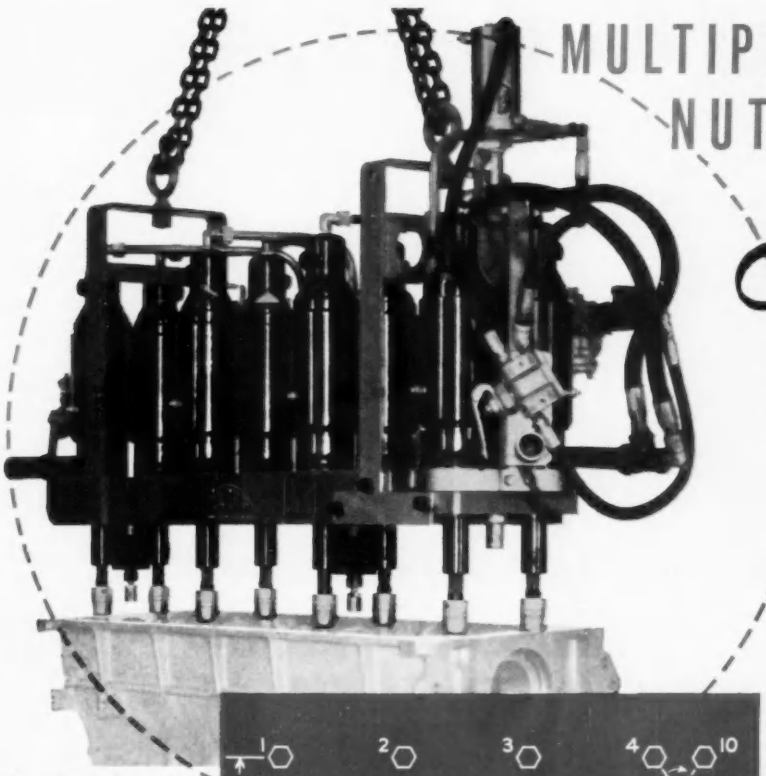
RIVETT furnishes a complete power package

AIR AND HYDRAULIC — VALVES, CYLINDERS, POWER UNITS

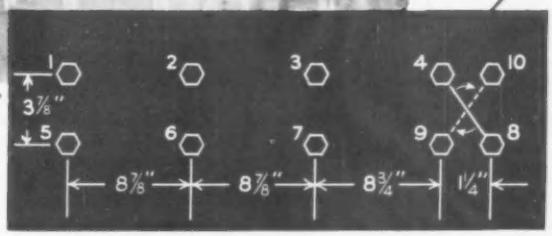
Member — National Fluid Power Association

MULTIPLE-SPINDLE NUTSETTER

Custom-Built by Cleco



Cleco 8-spindle nutsetter with special indexing feature to handle 10 bolts. Inlet air pressure is regulated and each drive motor is equipped with a metering valve backhead. Torque variation in the unit is held to no measurable difference.



Cap-bolt pattern for truck engine. Operation one runs bolts 1-8. Operation two completes the assembly.

Cuts rundown time on Bearing Cap Bolts in Half...reduces Torque Inspection from 100% to Spot-Checking!

A leading heavy equipment manufacturer eliminated a production bottleneck and obtained unparalleled uniformity of torque with the pneumatic nutsetting machine shown above.

This machine runs down main bearing cap bolts on a truck engine in less than half the time formerly required using an impact wrench. And the pre-regulated torque on each bolt has proven so invariable that the 100 per cent torque inspection formerly required has been reduced to occasional spot inspections!

Development of a multiple for this particular application required the ingenuity typical of CLECO engineers. Two pairs of bolts on the rear main bearing cap are spaced too closely to be run by four nutsetting motors of the size meeting torque requirements (see diagram). CLECO solved this knotty problem by mounting the two end motors on a special index plate. After the simultaneous rundown of bolts 1 through 8, air pressure is released on the end units and they are repositioned with one movement for rundown of bolts 9 and 10, while the remaining units are idle. This indexing feature permits a single nutsetter to do the work of two.

This machine joins a long list of other custom-engineered multiple-spindle units — using standard, proven CLECO Air Motors—which have quickly paid for themselves by effecting tremendous economies in high-volume assembly and disassembly operations. A CLECO multiple can be designed to do the same for you, whether your application calls for two driving spindles or 24, or more.

See Cleco Multiples at the ASTE SHOW, Booth 1871, May 1-8, 1958

CLECO AIR TOOLS

Write for new Multiples Brochure MS-358 or consult CLECO engineers on your specific assembly problems!

Division of REED ROLLER BIT COMPANY

P. O. BOX 2119 • HOUSTON 1, TEXAS

IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd.
927 Millwood Road, Leaside (Toronto), Ontario

by Carl F. Joseph
Technical Director

CENTRAL FOUNDRY DIVISION
GENERAL MOTORS
CORPORATION

.....The metallurgy of strength and

The secret of a stronger iron casting lies in the composition, the melting and the heat-treating processes. Perhaps I should use some other word than "secret," because the fact is well known today, but in 1925, when we started our search for a stronger iron, the principle was well known only in respect to steel.

Our research led us to think that heat-treating could improve iron as well. After considerable experimentation, we learned how to arrest the malleablizing process to produce an improved pearlitic malleable iron . . . an iron that compares favorably with the properties of a good grade forged steel. It is from the words "Arrested Malleable iron with Steel-like characteristics" that the name "ArmaSteel" was coined.

The raw materials and melting process for ArmaSteel are very similar to those of our malleable iron . . . the major difference being in the heat-treat cycle. In the cupola, we melt steel scrap, ferrosilicon, and remelt. We add .0025% boron to the charge to assist in breaking down carbides during malleablizing.

Next, the molten iron is tapped into a forehearth where it is desulphurized with soda ash. This removes small particles of slag and impurities, thus improving machinability of the casting. After refining in an electric furnace, the iron is tapped into ladles.

To improve the physical properties on certain castings, .007% bismuth is added as a ladle inoculant: this stabilizes the carbides during the initial freezing of the metal. On heavy castings such as the Pontiac crankshaft, up to .02% bismuth is added. This bismuth-boron combination is a new development.

I mentioned before that the heat-treating of ArmaSteel greatly affected its properties. Actually, we use several different heat-treatments to produce the several ranges of ArmaSteel. All are alike during the malleablizing cycle, where the massive carbides are eliminated. Malleablizing requires about 20 hours: the castings are held at 1750°F. for 10 hours, and near the end of the cycle are dropped to 1650°F., after which they are air-quenched. Brinell hardness at this point is around 300.

Tempering brings the Brinell hardness down to customer's specifications. We produce two standard Brinell ranges of air-quenched and tempered ArmaSteel . . . BHN 197 to 241 (3.9-4.3 mm.), and 163 to 207 (4.2-4.7 mm.). The castings are tempered in a recirculating furnace. The harder material is in the furnace for a total of six hours and forty minutes, and is held at heat for three and one half to four hours at 1270° to 1290°F. The softer material uses the same time cycle but higher heat . . . from 1320° to 1340°F.

For automobile crankshafts, a special hardness range is used. The ArmaSteel is air-quenched and tempered, but the tempering is for six hours at 1200°F., which produces a harder material (BHN 217 to 269).

Two other types of ArmaSteel are produced by reheating the air-quenched castings to 1600°, holding at heat for thirty minutes, then oil-quenching. These are then tempered for three and one half hours at 1170° to 1190°F. BHN is 241 to 269 (3.7-3.9 mm.) and 269 to 302 (3.5-3.7 mm.).

I've gone into detail on heat-treating because it has such a great effect on mechanical properties. Tempering directly controls the amount of combined carbon in the matrix, and this in turn dictates how hard and strong the ArmaSteel will be . . . the higher the combined carbon, the stronger, harder, and less ductile the casting. Thus, the engineer can choose the combination of properties best suited to his application. I can best explain the results of this careful heat-treatment by giving you a brief list of the mechanical properties of ArmaSteel.

1. *Machinability* . . . Because of the carbon nodules in the pearlite matrix, the machinability of ArmaSteel is generally from 10 to 30 percent better than that of steel forgings of the same Brinell. Improvements of up to ten times longer tool life and three times more pieces per machine have been shown.

73-A

2. *Selective Hardening* . . . ArmaSteel responds readily to localized hardening, either by flame or induction methods. A minimum of Rockwell "C" 50 is obtainable on such parts as shifter yokes, rocker arms, and gears. Some applications use the lead immersion or hot salt bath methods, followed by an oil-quench.

3. *Bearing Properties* . . . ArmaSteel is such an efficient bearing material on a hardened steel shaft that bronze bushings are often eliminated. The automotive rocker arm illustrates this excellent non-seizing property in metal-to-metal wear.

4. *High Yield Ratio* . . . The oil-quenched and tempered ArmaSteel has a minimum yield strength of 80,000 psi and ultimate strength of 100,000 psi, making it ideal for highly stressed parts.

5. *Fine Machine Finish* . . . A mirror-like finish can be produced on ArmaSteel. Diesel pistons are an application where this fine finish reduces friction wear to a minimum.

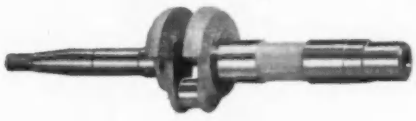
6. *Damping Characteristics* . . . In both small engines and in automotive engines, ArmaSteel crankshafts exhibit a fine damping capacity that aids quiet operation.

7. *Wear Resistance* . . . ArmaSteel withstands excessive wear under heavy loads at high speed.

8. *Fatigue Life* . . . ArmaSteel has good resistance to fatigue, giving maximum endurance and long life.

As countless and varied applications have proven, ArmaSteel is an outstanding engineering material. For information on how your product can benefit from this modern casting metal, write for our "ArmaSteel" catalog.

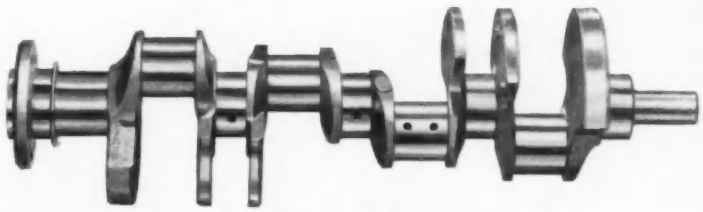
ARMASTEEL® from the standpoint of machinability



ArmaSteel small horsepower engine crankshafts provide good damping qualities and modest cost due to excellent machinability.

ArmaSteel's adaptability to localized hardening pays off especially well on these automotive rocker arms.

Because of its excellent wear resistance, oil-quenched and tempered ArmaSteel with a Brinell of 241 to 269 has replaced an SAE steel forging for this automotive reverse internal gear.



Pontiac's conversion to ArmaSteel Crankshafts doubled cutter life and speeded up by 50% the grinding of main journals.

CENTRAL FOUNDRY DIVISION

GENERAL MOTORS CORPORATION • SAGINAW, MICHIGAN • DEPT. 24

New Design and Construction of

PART II

● Leveling Valves

Air Suspension Systems for

●

LEVELING VALVES

Buick

One height control valve is located in the center of the front spring cross-member and is controlled by a lever clamped to the middle of the front stabilizer bar. Two additional height control valves are located just ahead of the rear axle on the frame rear spring cross-member and are connected to the rear axle assembly inboard from the wheels through levers and links.

The height control valve, shown in Fig. 1, in detail, consists of two spring-loaded, rubber-sealed valves; one inlet and one exhaust, operated by an arm connected to a shaft to the exterior. When the car is too low, the inlet valves are opened; when too high, the exhaust. The free play in the lever between the two valves permits plus or minus one-quarter inch variation in car height at front and rear before valves operate.

Control pressures are adequate to maintain levelness of car with loads up to five passengers in the car and 500 lb in the trunk. During development, various air flow control mechanisms were incorporated in the controls. The design finally accepted consisted of flow restrictions through 0.025 in. orifices protected by screens immediately ahead of them. The screens were mainly a precaution, as considerable running was done without clogging the orifices. These orifices gave satisfactory control of the air system while traversing winding roads with a variety of curves. With the rate of flow established for this condition, the restrictions were found to be satisfactory for rough road travel or leveling when passengers enter or leave the vehicle.

Ford

The leveling control is obtained through three leveling valves.

Fig. 1—Buick height control valve

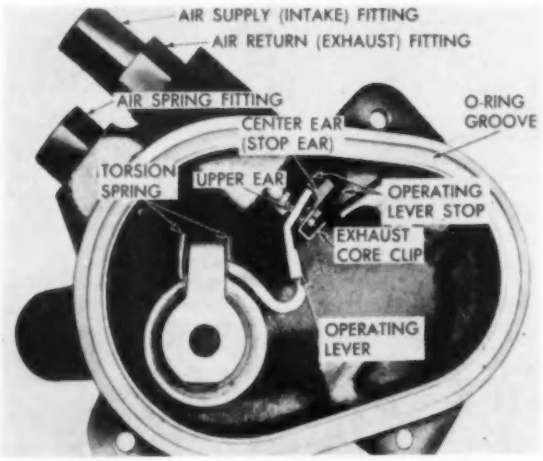
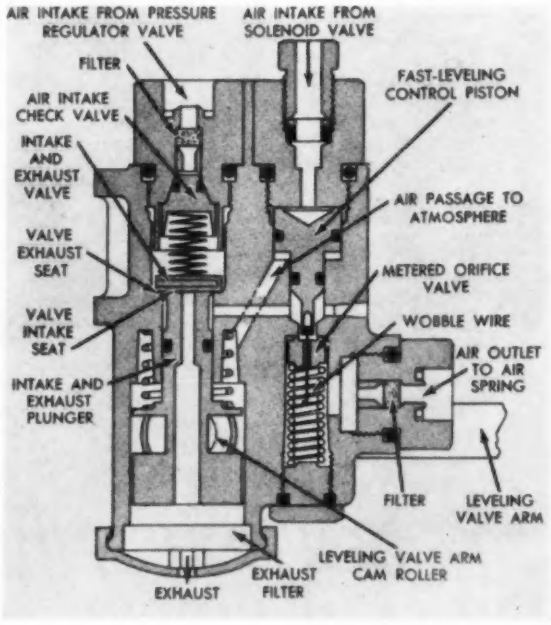


Fig. 2—Ford leveling valve cross-section



● Auxiliary Components ● Compressors

Passenger Cars

THIS is the second part of a two-part article devoted to air suspension systems offered as optional equipment on Buick, Ford, Chevrolet, Oldsmobile, and Rambler passenger cars for 1958.

The first installment, which appeared in the February 15, 1958, issue of AUTOMOTIVE INDUSTRIES, covered overall layouts of the systems and the air springs.

Material for the entire article was prepared from five papers presented at the Annual Meeting of the Society of Automotive Engineers in January at Detroit.

There is a leveling valve at each of the two front springs and a common leveling valve to control the two rear springs. The actuating levers are attached to the upper suspension arms in the front and to the rear axle housing in the rear, by adjustable links.

The leveling valves provide dual or "slow-fast" type of leveling control. When the car is being driven, or is standing with the doors closed, and a height adjustment is required, air is directed to or from the springs through highly restricted passages in the leveling valves so that height changes occur slowly. However, when the doors are opened for passengers to enter or leave the car, a solenoid valve is actuated. This pneumatically opens a relatively unrestricted bypass in each leveling valve through which the springs are filled or exhausted depending on attitude of the car.

Fig. 2 is a cross-section of the leveling valve showing the component parts. The left portion of the valve controls normal slow-leveling. The right side controls fast-leveling. The valve body is an aluminum die cast part and all of the pistons are coated steel. This combination was found to give excellent life and a minimum of wear and scuffing. All of the seals are made of specially developed, synthetic rubber materials. It was found convenient from a manufacturing standpoint to make the metered orifice valve of nylon with the 0.012 in. metering hole molded into the part. A fine wire 0.009 in. diam passes through the 0.012 in. hole. This not only serves to reduce its effective area but also acts as a cleaning means.

The solenoid valve is actuated by the dome light switches mounted in the door hinge pillars. As noted above, its purpose is to provide air at reservoir pressure (300) to the fast action mechanisms in the three valves when the doors are opened and any appreciable load change occurs. It also acts as a high pressure relief valve for the system and will open at 400 psi if the system pressure should become abnormally high.

In order to provide adequate rear suspension roll resistance, the two rear springs are isolated with regard to air transfer by a restrictor valve. This valve is also triggered by high pressure air from the solenoid so that, when fast leveling action is required, the high restriction orifice is temporarily by-passed.

The T-check valves between the leveling valves and air springs are low pressure limiting devices which prevent the springs from exhausting below a set minimum value (55-65 psi front and 25-35 psi rear). They prevent extreme leveling action which would otherwise occur when one wheel is jacked up for tire changing, and they prevent complete loss of air from the springs if a leak develops elsewhere in the system.

Chevrolet

Two leveling valves are used in the front, one in each spring, and a single valve is installed in the left rear. The left rear spring is cross-connected to the right rear spring by a balance line which includes a 0.020 in. orifice.

The rate of air flow to the springs is controlled by orifices in the leveling valves. The inlet and exhaust orifices in the front leveling valves are 0.020 in. diam. In the left rear, the inlet orifice is 0.031 in. diam, and the exhaust orifice 0.042 in. diam. Because a single leveling valve controls both rear air springs, the larger orifices are necessary to permit the rear springs to level at approximately the same rate as the front springs.

When the engine is shut off and air is exhausted, as in passenger

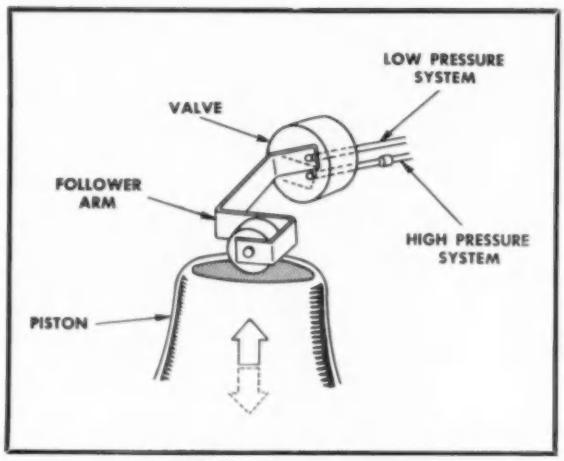


Fig. 3—Chevrolet leveling valve schematic

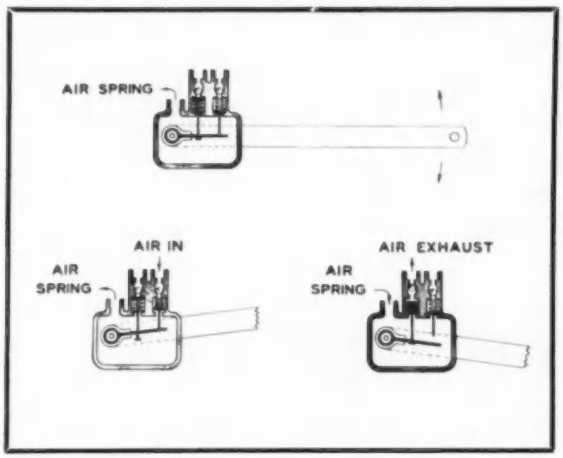


Fig. 4—Rambler leveling valve schematic

unloading, the air escapes from the system through a low pressure blow-off valve set at 25 psi. This blow-off pressure is sufficiently high to prevent the escape of air during ride motions. A check valve is built into each leveling valve to prevent back flow into the air supply line. This feature prevents deflation of the spring should the car be inadvertently loaded with zero pressure in the reservoir.

In the Chevrolet Level Air suspension, the design of the leveling valve is very simple. A spring-loaded lever rides on top of the piston in the air spring. The lever, through linkage, opens and closes the orifices in the valve, as determined by the position of the piston. At design position, both orifices are closed. The metering orifices are incorporated in the valve seats. (Fig. 3)

The leveling valve has a zinc die cast body and two stamped sheet metal valve levers. A common spring loads both valve levers against their seats. The orifices are incorporated in the valve seats, and because their diameters are small, only a slight spring force is required to hold the valves closed against air pressure in the line. Lugs on the inner end of the follower lever pick up tabs on the valve levers to open the valves around a common shaft. These tabs can be bent during manufacture to adjust the "dead band" or inactive portion of the leveling valve travel.

A spring on the follower keeps the roller in contact with the top of the piston during ride motions. In order to reduce the travel requirement of the valve levers, the follower is prevented from following the piston beyond 1½ in. of wheel travel in rebound, since more than 1½ in. is beyond the normal wheel amplitude. The roller and piston normally remain in contact. The natural frequency of the lever is high enough to maintain contact during wheel hop. This feature also disconnects the leveling valve linkage from the suspension arm and thus averts accidental damage to the valve if the rebound stops of the axle are removed in service.

A number of advantages have been gained from this integral air spring and valve construction. Several air seals are eliminated, simplifying the design of the valve and the connecting air lines. The valve operating linkage can be made relatively simple and light in weight since it is completely protected from exterior environment such as road splash, snow and ice. The spring design can be set to length and checked as a complete sub-assembly prior to installation in the vehicle in a manner very similar to that for a conventional spring.

In addition to the plus features of having the air valve installed in the reservoir, as previously listed, the design is relatively simple to service. This has been accomplished by designing the valve so that it can be installed or removed through the mounting boss on the side of the air spring assembly.

Oldsmobile

Three height control valves maintain the car at constant trim height regardless of passenger load. Two valves are used at the rear, one located near each rear spring, with the actuating arm connected to the suspension by a short rubber insulated link. Rear height adjustment is made by turning an eccentric in the actuating arm. One valve, centrally mounted at the front of the chassis, is actuated by a linkage arrangement from the front stabilizer bar. This linkage also has the eccentric design for height adjustment. Small orifices in each valve restrict the flow of air to and from the springs, thereby permitting the inlet and exhaust valves to function without a delay mechanism or "dashpot" effect as was used on some early systems.

A check valve tee is used in conjunction with the single front height valve that controls the two front springs. The check tee permits full flow of intake air to the springs as the ball checks move from their seats; however, exhaust air from the springs must pass through small orifices in the ball check seats. This feature prevents free flow of air from spring

to spring which would be detrimental to car handling, but does provide a restricted inter-communication between front springs to enable them to equalize in pressures in a relatively short time.

Rambler

A single leveling valve is mounted near the center of the body above the rear axle. With the car empty, 20 psi pressure exists in the air spring. The principal function of the leveling valve (Fig. 4) is to admit air to the air springs when the load in the car is increased and also to exhaust air from the springs when the load is decreased. The leveling valve contains ball check restrictions to limit the flow of air so that very little air is used when driving over bumps in the road at normal speeds. The duration of the suspension disturbance caused by these bumps is so short that the small amount of air admitted or exhausted by the leveling valve does not affect the height of the car.

The exhaust port of the leveling valve is connected to a pressure-limiting valve which keeps the pressure in the air spring from getting below 18 psi. This prevents the spring from being entirely deflated if the body is jacked up to change the tire or to lubricate the chassis components. In shipping new cars, the air is released from the system. Since most of the load is on the coil springs, the car can be transported without any air in the system. In an emergency, the car can be driven without any air supply. Running the engine for approximately ½ minute supplies ample air pressure for normal operation of the car.

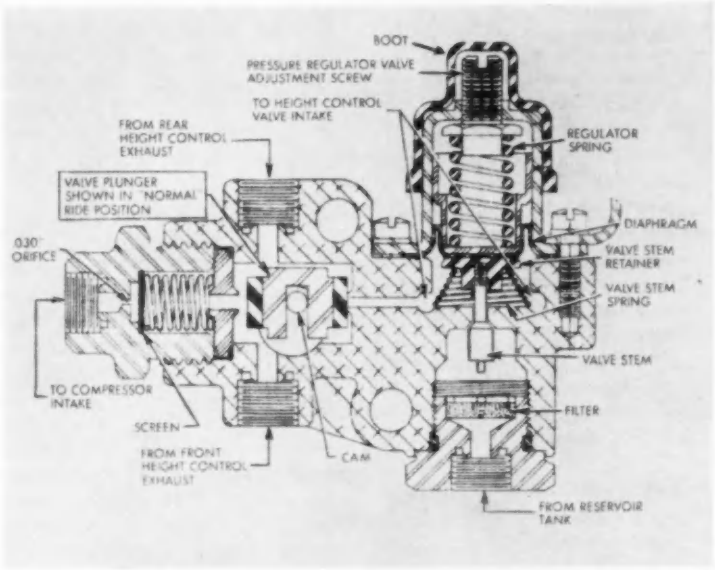


Fig. 5—Buick manual override valve cross-section

AUXILIARY COMPONENTS

Buick

The manual override valve, shown in Fig. 5, receives air from the high pressure reservoir tank. Incorporated in this unit is the pressure regulator valve set to limit air pressure past it to 145 psi. Air flows from this valve to the respective leveling valves and air springs, returning through the leveling valves to the low pressure chamber and then through a 0.030 in. orifice to the compressor intake.

The manual override valve has another function—that of raising the car over four inches when a knob under the instrument board is pulled. This operation causes a valve plunger in the override valve to shut off the exhaust line to the compressor and open the exhaust lines of the height control valves to the 145 psi air normally reaching the valves through the inlet lines only. The air through the exhaust lines raises the exhaust valves off their seats and fills the air springs with 145 psi air, overruling the height control valves' normal function. This causes the air springs to lift the car up against the rebound bumpers over four inches in front and approximately five and one-half in the rear. This function is useful for abnormal conditions such as pulling through mud holes, deep snow, high crowned roads, or loading the car on unusual lift hoists. While the ride is, of course, not comparable to normal, this function can be very helpful.

Included in the low pressure line is a pressure relief valve, set at 150 psi minimum, to act as a safety valve should the air pressure become too high in the override position of the valve due to possible leakage of the 145 psi reducing valve. This has not been a problem, but is an additional precaution to insure reliability.

The compressor check valve is located adjacent to the compressor in the high pressure line. This valve simply prevents air from the storage tank backing up into the compressor and leaking down slowly when the car is parked.

Ford

The 400 cu in. air reservoir is mounted in the right front fender and is connected to the compressor by a flexible hose. A one-way check valve prevents flow of air from the reservoir to the compressor when the engine is not running. A manual drain valve is

provided at the low point of the reservoir for the removal of any accumulated moisture. The reservoir provides air to operate the system when the compressor is not running.

Copper tubing is used for all lines which are constantly under pressure. Nylon tubing is used for the lines which are only intermittently under pressure; these are, the solenoid to leveling valve lines and the solenoid to restrictor valve line. All lines are connected to the various units of the system by special fittings with rubber "O" rings to prevent leakage.

Design specifications require that all elements in the air system operate satisfactorily from —40 F to 200 F without malfunctioning or leakage resulting.

Chevrolet

The high pressure air reservoir has a volume of 360 cu in. and when fully charged operates at 250 psi. Enough energy is stored in this tank to quickly level a five passenger load, with the engine shut off. This tank is of welded construction, and has a minimum burst pressure of 1000 psi.

It was early realized that making the air suspension leak free was one of the most immediate problems. As a result, a modified rubber "O" ring type fitting was developed for use in all connections.

Oldsmobile

The oil and moisture separator (Fig. 6) is mounted on the chassis below the compressor, and connected to it by flexible high and low pressure hoses. All other pipes and tanks are chassis mounted, the high and low pressure system pipes originating at the separator assembly. This unit contains a high pressure check valve and low pressure cut-off valve designed to prevent loss of air back through the compressor when the engine is not running. Also, the flexible high and low pressure hoses may be disconnected if necessary while performing service work on the engine without losing air from the suspension system.

High pressure air from the compressor flows into the separator past the high pressure check valve, through the filter bowl and filter where oil particles and moisture are removed before passing on to the high pressure storage tank.

Additional features of this unit are the low pressure system blow-off valve, and filtering valve at the fresh air intake port. A sediment drain at the bottom of the separator bowl provides for ease in servicing this unit.

All air pipes in the system are copper for maximum rust protection. All air line fittings are sealed in rubber to prevent leaks from shock and vibration. The air line connections (Fig. 7) use a beaded pipe end with a long pilot into the fitting. A rectangular section "O" ring fits onto the tube end and in a cavity of the fitting to provide a positive air seal.

AIR COMPRESSORS

Buick

Air is furnished by a compressor driven by the engine through a V-belt at 1.15 times crankshaft speed, delivering air up to 290 psi stall pressure. Figure 8 shows a section through the compressor, which is assembled ahead of the steering pump and combined with it, both operating from a common oil reservoir. This unit has two cylinders 90-deg apart, operating on a plain crankshaft. It has a 1.875 in. bore by 0.906 in. stroke, giving a displacement of five cubic inches per revolution. The cylinders and heads are aluminum, with cast-iron sleeve inserts in the cylinders. Valves are the fa-

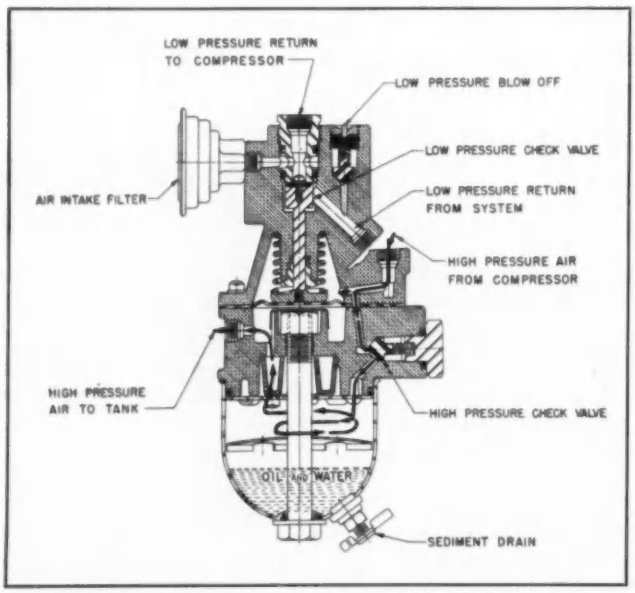


Fig. 6—Oldsmobile oil separator and check valve assembly

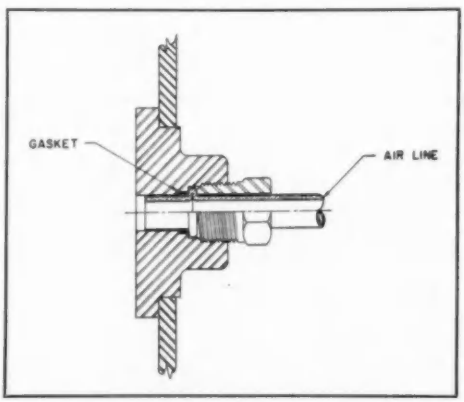


Fig. 7—Oldsmobile air line connection

miliar reed type. A small vane pump provides lubrication to all bearings and also scavenges the compressor sump.

Ford

The compressor is a specially-developed single cylinder air-cooled pump. It is belt driven by the engine at approximately engine speed and is lubricated by engine oil. Its piston displacement is 2.71 cu in. Balance pressure is approximately 300 psi and maximum power requirement is one horsepower.

Chevrolet

The engine-driven air compressor (Fig. 9) is designed for high production. It has a steel liner in a die cast aluminum cylinder block, and a die cast head. The intake valve is a reed valve, and the exhaust valve is a disk type poppet. This construction eliminates the valve plate normally used in reed valve compressors. One advantage of this arrangement is a cooler exhaust valve because the heat in the valve plate does not have to pass through a gasketed surface to be dissipated by the fins of the head.

Oldsmobile

The air compressor (Fig. 10) is a two-cylinder V-block design having a piston displacement of five cubic inches. It is driven from the engine with a pair of matched belts, and the compressor crankshaft end is extended to the rear to drive the power steering pump rotor. A lubrication pump is incorporated into the compressor design and takes its oil from the power steering pump reservoir.

Rambler

A Bendix-Westinghouse compressor having a piston displacement of 2.7 cu in. supplies one cubic foot of air per minute at 150 psi, at 50 mph. This compressor is driven from the engine by a belt and runs 1.1 times engine speed on the V-8 engine and 0.85 times engine speed on the six-cylinder engine.

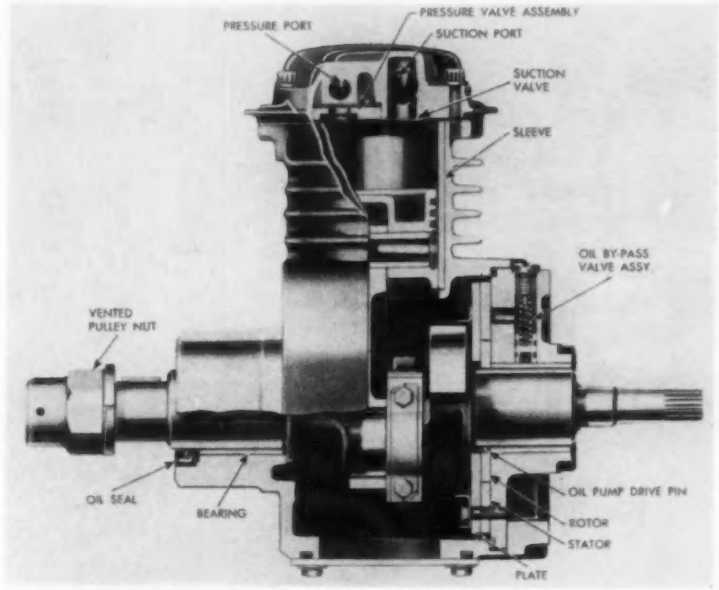


Fig. 8—Buick air compressor

AUTHORS OF THE SAE PAPERS FROM WHICH MATERIAL WAS OBTAINED FOR THIS ARTICLE

Forest McFarland, Gail Peckham and Eric Dietrich, Buick Motor Div., General Motors Corp.—"The Buick Air-Poise Suspension."

C. F. O'Shea, Ford Motor Co.—"The Ford Approach to Air Suspension."

K. H. Hansen, J. F. Bertsch and R. E. Denzer, Chevrolet Motor Div., General Motors Corp.—"1958 Chevrolet Level Air Suspension."

R. W. Perkins, Oldsmobile Div., General Motors Corp.—"Oldsmobile New-Matic Ride."

Wallace S. Berry, American Motors Corp.—"The Air Coil Spring."

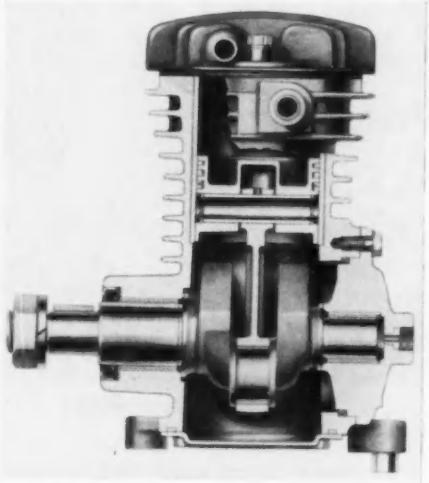
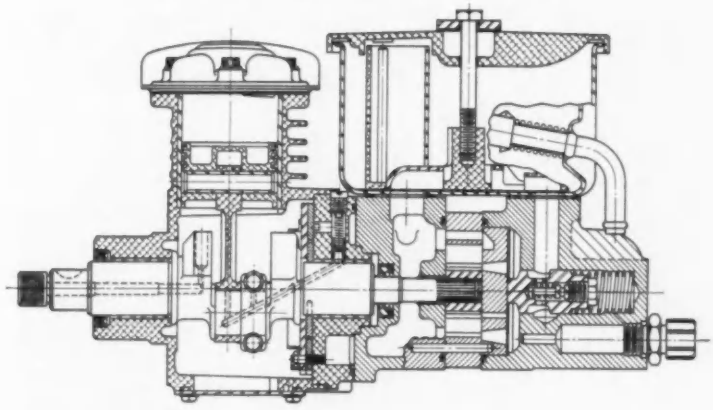


Fig. 9—Chevrolet air compressor

Fig. 10—Oldsmobile air compressor assembly



Advanced Test Equipment in Continental's New Laboratory

Fig. 1—Turbine component test rig

Fig. 2—Typical control panel for operation of turbine test rig

AN outstanding test facility—the Component and Environmental Laboratory—has been placed in operation recently by the Continental Aviation & Engineering Corp. as an adjunct to its Toledo Manufacturing Division which produces jet engines, gas turbines, and compressors. Entirely new, this laboratory is equipped with the most advanced test facilities known to the art. Its function is to maintain a continuous schedule of testing of components for production machines, on improved components and advanced designs.

In addition, the laboratory has been equipped for simulated flight testing of jet engines at altitudes ranging upwards of 55,000 ft. Within a year the company expects to install additional equipment for simulated flight at altitudes up to 65,000 ft, depending upon the mass-volume of a given machine.

To provide a quick impression of the character and scope of this laboratory, we have selected a group of illustrations typical of the activity. The caption material describing these views should give the reader a good idea of the activities.

Typical of the test sections is Fig. 1, illustrating the turbine component test rig with an experimental turbine wheel in the process of installation for aerothermodynamic evaluation. Air for the test rig is supplied by the laboratory ram blower system. Before entering the test rig, the air stream is heated to temperatures between 150 F and 200 F by means of an electrical backheater. Normal delivery pressure to the experimental

turbine is at 30-in. HGA, the desired turbine pressure ratio being obtained by setting the pressure downstream of the turbine with the laboratory vacuum system. Power developed by the turbine is absorbed by the water brake.

A typical control panel for the operation of a test rig is seen in Fig. 2. The turbine test rig may be seen faintly through the observation window. Controls for setting the airflow, the water-brake load which controls the speed at a given turbine pressure ratio, as well as the oil system controls all are located centrally for convenient operation. Gages and manometers for collecting aerothermodynamic data also are located in the control room.

The first two stages of the laboratory refrigeration compressors are shown in Fig. 3. These two stages in conjunction with the booster stage, located in the background, constitute the heart of the laboratory refrigeration system. It can deliver 11-lb of air per second at a temperature of minus 70 F.

The interior of the laboratory cold room, Fig. 4, shows the facilities for conducting complete environmental investigations of gas turbine power plants and components. At the time this view was taken, a gas turbine starting cart (produced by CAE) had been installed for cold starting evaluation. The cold room can be supplied with conditioned air at 11-lb per second at ambient pressure over a temperature range of minus 65 F to plus 130 F.

The nozzle and test section of the supersonic wind tunnel for investigating flow passages and compressor and turbine blading at flow Mach numbers from 2.1 to 2.5 is seen in Fig. 5. This tunnel is operated with 11 to 7.7 lb of air per second, depending upon the Mach number desired at the test section. Before the air is admitted to the test section it is passed through the laboratory refrigeration system for thorough drying. Air is exhausted from the tunnel by the laboratory vacuum system.

A view of the 2300-volt switch-

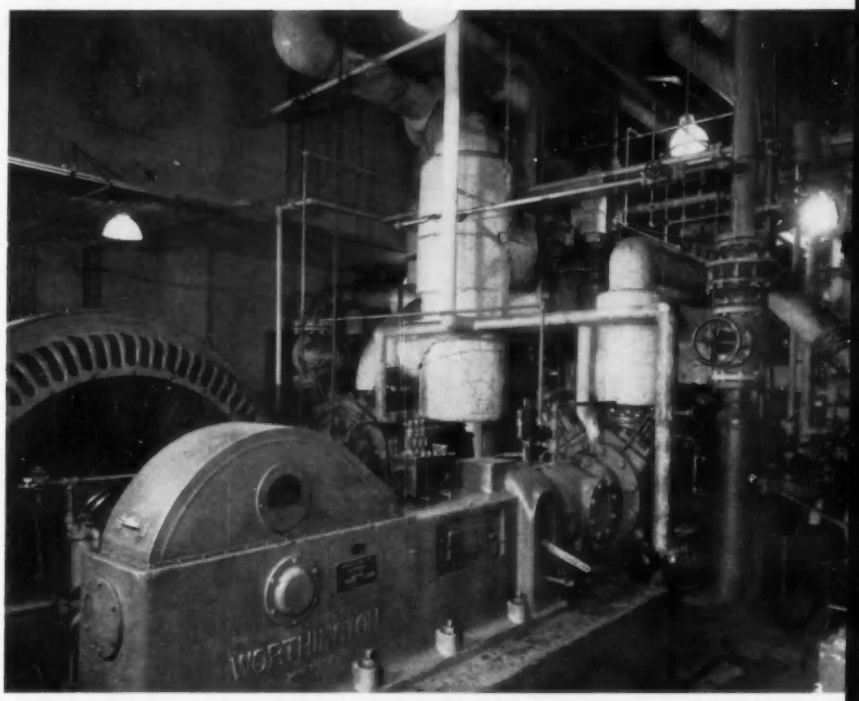


Fig. 3—First two stages of laboratory refrigeration compressors

Fig. 4—Interior of laboratory cold room

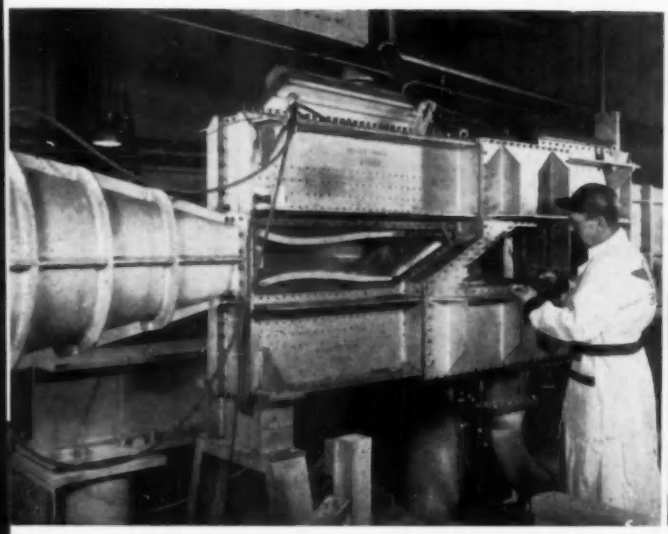


Fig. 5—Nozzle and test section of supersonic test tunnel

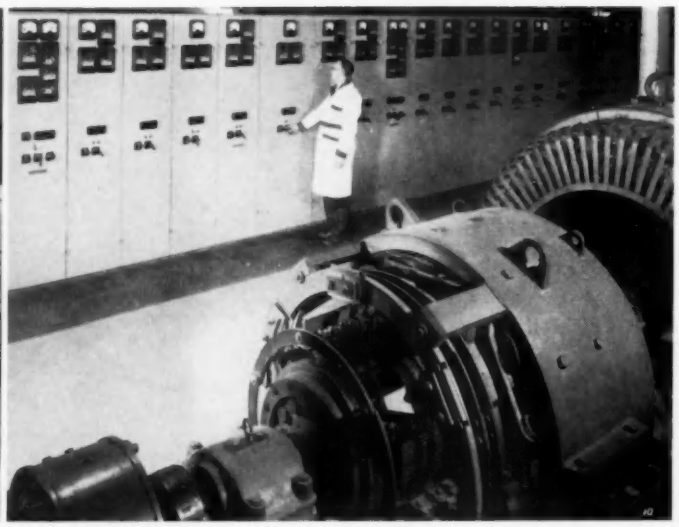


Fig. 6—Switchgear panel for operating vacuum pumps, etc., in background. In foreground is a 600 kw, d-c generator

gear panel for operating the vacuum pumps, ram blowers, refrigeration compressors, and a Fuller compressor is shown in Fig. 6. In the foreground is a 600 kw direct current generator.

The main components of the 4000-hp test rig for compressor research and development is shown in Fig. 7. It consists of a 650-hp dynamometer and 3500-hp wound rotor motor and a two-stage speed increaser. The first stage of the gear box increases the maximum output shaft speed of the motor from 1156 to 10,165 rpm. The second speed range increases output shaft speed to 30,245 rpm for driving high speed experimental compressors. In the foreground is the exhaust plenum on which the experimental compressors are mounted.

Interior of altitude chamber No. 2 is seen in Fig. 8 with a J69-T-19 turbojet engine installed for altitude investigation. At present the ram refrigeration and vacuum systems permit simulation of altitudes between 15,000 and 55,000 feet for CAE turbine engines having a range of 900 to 1100-lb thrust. During operation the chamber pressure is reduced to 1/6th of normal sea level atmospheric pressure. The air consumed by the engine can be controlled over a temperature range from minus 65 F to plus 130 F.

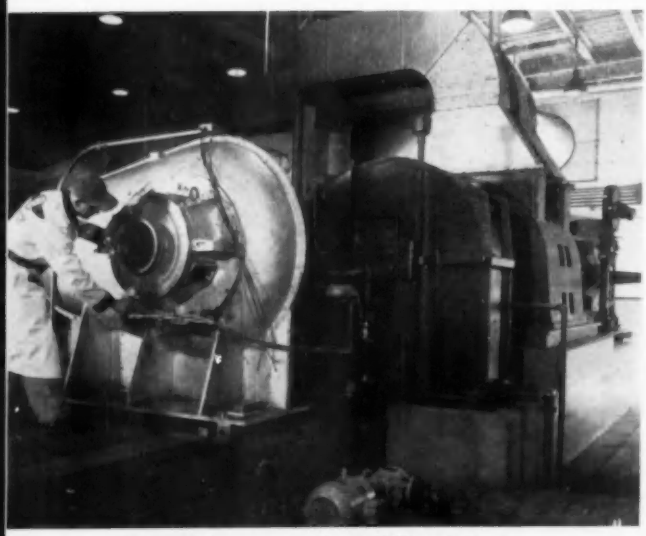


Fig. 7—Main components of 4000-hp test rig

Fig. 8—Interior of altitude chamber No. 2 with a J69-T-19 turbojet engine installed ▶

Lincoln's Power Steering Gear Has TORSION BAR CONTROL

A NEW power assisted steering gear, which is said to provide a natural steering feel for all driving conditions, is standard equipment on the 1958 Lincoln and Continental cars. The unit was designed by Ford Motor Co. engineers and is produced at the company's Indianapolis, Ind., Steering Gear Plant.

This gear introduces a unique method of power assist control by use of a torsion bar. The torsion bar reduces the valve centering load to zero. With the gear's torsion rod action, there is a smoother transition from no power to full power assist. Road shock and vibration are reduced, and assistance in recovery of the front wheels after a turn is improved.

This new gear reduces pull on the steering wheel to approximately one pound in normal straight-ahead driving. The previous gear required a driver effort of approximately three pounds pull on the wheel.

Cutaway view of the new Lincoln and Continental power assisted steering gear

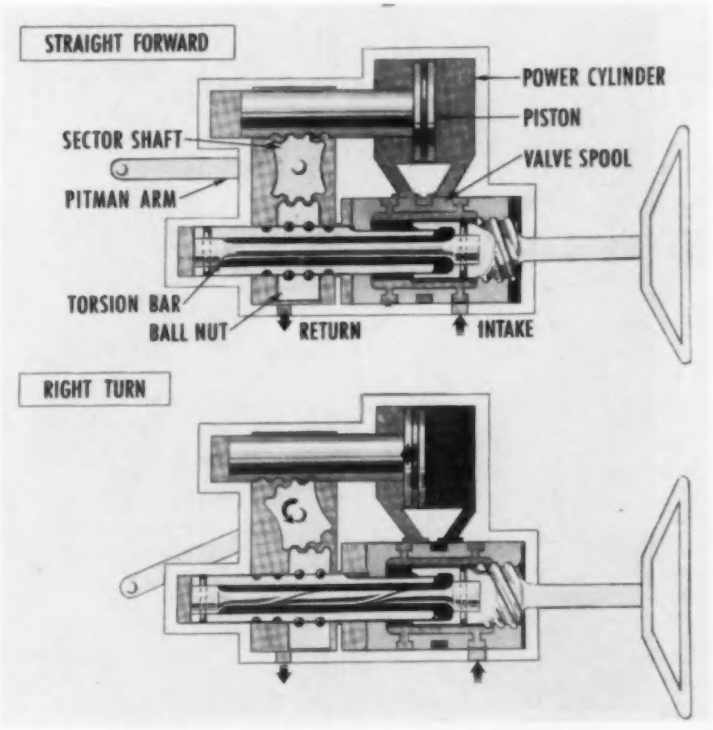
Construction of the Unit

In addition to the new torsion rod principle used, a hydraulically balanced design valve is mechanically centered, making possible a system with equal effort in either direction.

Steering sector shaft, worm and ball nut, power piston rack, torsion rod, and power cylinder are in one housing, making possible internal oil passages between the valve and the double-acting power cylinder. This feature eliminates all external lines and hoses except the pressure and return hoses between the pump and valve.

The steering gear consists primarily of a gear reduction unit

(*Turn to page* 61, *please*)



Schematic illustration of torsion rod steering operation

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By Samuel Cummings

AUTOMATIC FACTORY

An automatic factory described as having "the nation's first all electronically controlled line of machine tools" was made public recently by Hughes Aircraft Co.

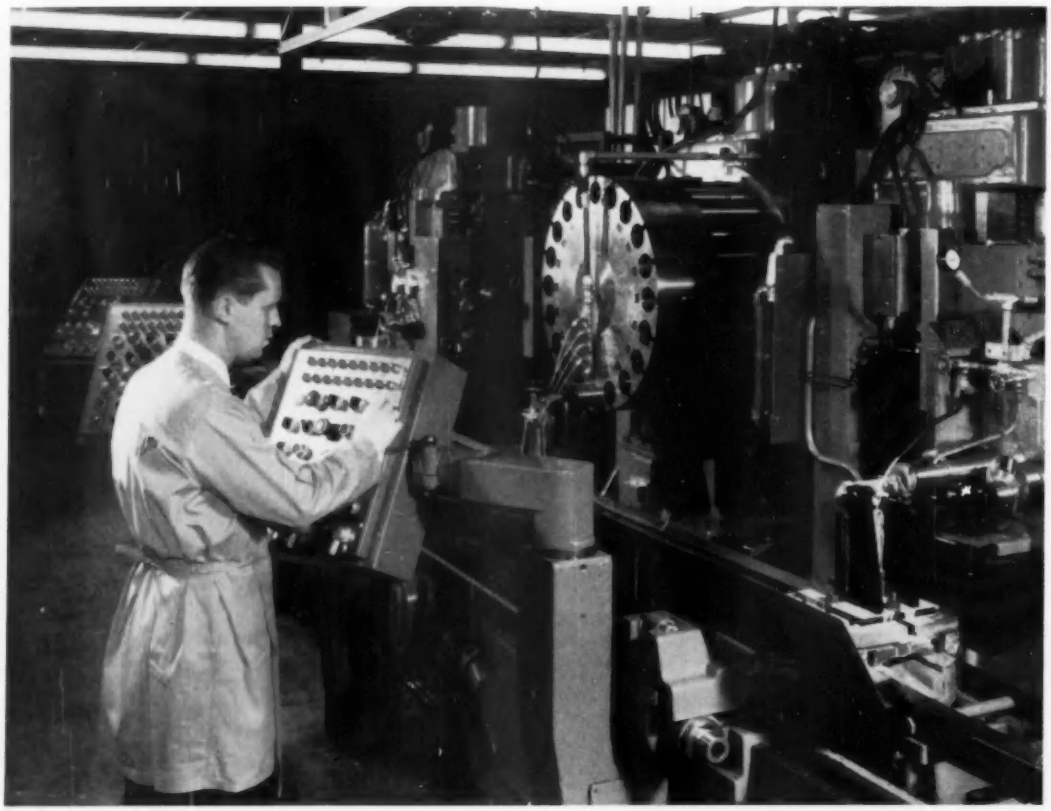
The line, installed in a plant adjoining Los Angeles' International Airport, is operated from punched tapes and directed by transistorized digital computers. Although it is still experimental, the line already is turning out vital parts for Hughes Aircraft electronic armament control systems now in use in all American and Canadian Air Force interceptor planes assigned to guard the North American continent.

Machines for the prototype equipment were designed and produced by Kearney & Trecker Corp. The first production system is scheduled to be delivered later this year.

Nucleus of Automatic Factory

Rollin M. Russell, Hughes vice-president and chief of the Products Group, explained that the company's Digitape electronic controls had been linked with a milling machine, a drilling machine, and a boring machine. The result, he said, was to make available for the first time the economies of Detroit-type mass production techniques to the small lot producer, who does most of the machining in American industry today.

"What we have here is the nucleus of the nation's first electronically automated factory," Russell declared. "Single machine tools have been electronically controlled in the past, but this is



Milling, drilling, and boring machines (left to right) developed by Hughes Aircraft and Kearney & Trecker are operated by new Digitape electronic controls. Here an engineer checks control panels.

the first successful application of automatic electronic controls to a series of machine tools working on successive operations and, in fact, making a variety of parts at the same time."

Francis J. Trecker, president of Kearney & Trecker, explained that both machines and controls are constructed to be fitted together as blocks in any desired number and arrangement to provide the greatest production savings for the type of parts to be machined. The line may be added to and rearranged from time to time and still be capable of operating from a single tape for each type of part.

Outstanding Characteristics

In the prototype system demonstrated, the human operator needs only to place unmachined castings on the line and remove finished parts, but even this operation can easily be made automatic, it was pointed out.

Tooling is on the average 50 per cent less. Thus there is a saving in tool design and production time and a shortening in time between engineering drawing release and actual production.

Several different parts may be manufactured on the line simultaneously. Changes can be made readily in the product even during a production run (often by simply splicing a change into the tape). Simple dial adjustment may be made to correct variations in cutting edge dimensions.

Engineer checks electronic compensator at the Hughes Aircraft Co. plant in Los Angeles. The compensator detects variations in cutting edge dimensions on automatic machine tool line and corrected signals are sent to machine tools without the need for repunching tape.

ELECTRONIC PILOT PLANT

A computer-controlled pilot plant small enough to fit into an average-size office is being built by Consolidated Electrodynamics Corp. for Esso Research and Engineering Co.

The new unit is being designed to analyze chemical changes in samples as small as a tenth of a drop of liquid in a fraction of the time now needed.

Heart of the miniature plant is an automatic program system that will take over and conduct an entire catalyst evaluation program once it is fed initial instructions.

The program will include an automatic pressure test for leaks, oil cycle, regeneration cycle, catalyst treating cycle and, finally, a shut down after a specified number of complete cycles. Temperatures, pressures, and gas and liquid stream compositions will be monitored, controlled and, in some cases, logged.

The computer digests the data and presents it in final form. With the complete finished information, an engineer is able to evaluate a new process in a matter of weeks instead of the months now required.

Consolidated Electrodynamics expects to complete the pilot plant sometime this summer.

TRANSISTOR DIODES

A new electronic revolution may be in the making with the replacement of conventional transistors by a new transistor diode.

Dr. William Shockley recently told the 1958 Transistor and Solid State Conference that four-layer diodes have been used to amplify digital signals in recent experiments at the Shockley Laboratory of Beckman Instruments, Inc.

There are many possible forms of transistor diodes, Dr. Shockley said, but the only one currently available is the four-layer diode now in pilot production at Beckman's Palo Alto, Calif., laboratory.

"Both lower costs and superior performance may result from replacing transistors with transistor diodes," Dr. Shockley said. This is so because "speed of operation of transistorized computers depends upon the thinness of layers in the semiconductors, and because it is difficult and costly to make contact to the middle layer of a conventional transistor. The difficulty increases as the layer becomes thinner and the speed of operation higher. The four-layer diode avoids this difficulty since it requires no connections to the middle two layers."

Dr. Shockley said that the new transistors will need further development before they can be used in digital computers and in other circuit applications such as antimissile systems. Meanwhile the demand for four-layer diodes has been so great that Beckman is establishing new production facilities at the Shockley laboratory at Stanford Industrial Park, Calif.

MINIATURE TUBES

An electron tube not much larger than a shirt button has been developed by the General Electric Research Laboratory.

The tube is constructed of layers of titanium and a special ceramic and is capable of operating at temperatures of from 900 to 1500 F.

The experimental models now being evaluated are shaped like flat disks and measure only ¼ in. in diameter and ⅛ in. thick. The tube's small size is due in part to the elimination of a heater, all the heat necessary being provided by its environment.

Company officials said the design is still in the laboratory stage and that no tubes are commercially available at this time.

(Turn to page 61, please)

Ford's New Diesel Tractor Engine

Tractor and Implement Division of Ford Motor Co. Adds Diesel-Powered Tractors for Farm and Industrial Use

Ford 841 model tractor equipped with the new Diesel engine

FORD DIESEL ENGINE SPECIFICATIONS

Type: Four cylinder, overhead valve, four-stroke engine with open chamber (direct injection) design

Dimensions: Length, 34.21 in.; width, 16.375 in.; height, 27.21 in.; bore, 3.90 in.; stroke, 3.60 in.; piston displacement, 172 cu in.; compression ratio, 16.1; weight, 565 lb. (including flywheel)

Power: Belt, with 5-speed transmission 40 @ 2200 rpm; with 4-speed transmission 37 @ 2000 rpm. Drawbar, 4 or 5-speed transmission, 35 @ 2000 rpm (Manufacturer's rating)

Fuel System: Injection pump, Roosa Master opposed-piston distributor type. Injectors, Simms four-orifice, angled in head. Fuel protection, micronic filter with water sediment chamber and air bleed valve

ECONOMY in production has been achieved in Ford's new Diesel tractor engine by redesigning some components of the gasoline four-cylinder tractor engine so that many of its parts could be used for a Diesel engine.

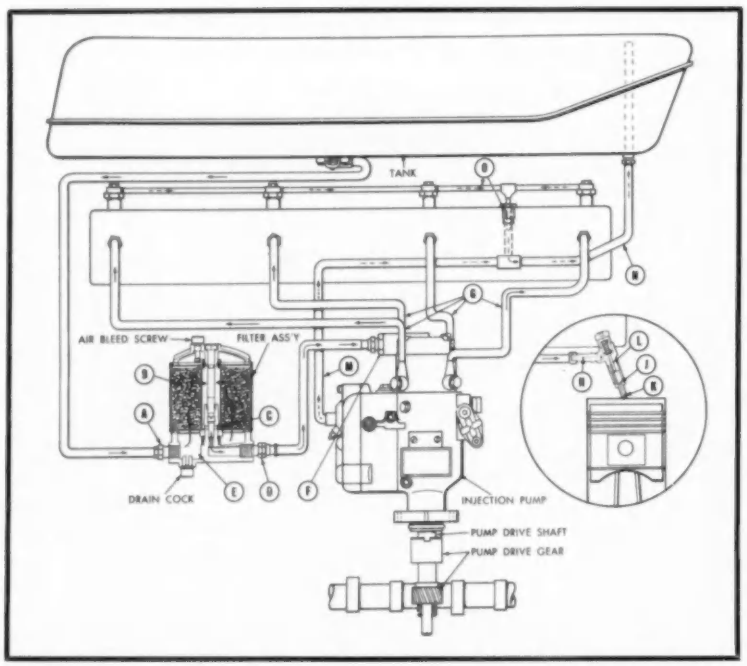
The Ford Diesels are similar in appearance to the new Powermaster models introduced in November. All implements in the Ford line will fit the Diesel tractors without modification.

The first Ford Diesel engine has a compression ratio of 16 to 1, a displacement of 172 cu in., and delivers 35 hp at the drawbar. The engine is available in the 801 and 901 series of Ford tractors—seven models in utility, row crop, and all-purpose types.

Normal starting is provided by a 12-volt electrical starter. Under extreme cold weather conditions, optional manifold pre-heaters or an ether cell may be used as a starting aid.

Although the Ford Diesel and gasoline engines are similar in size and appearance, the Diesel is equipped with much larger air intake, air cleaning and exhaust systems. The overhead valve type cylinder head has been designed to accommodate the fuel, air and pressure requirements of the Diesel. To adapt the Ford "Red Tiger" engine to Diesel use, heavier pistons equipped with five rings, forged steel crankshaft, new connecting rods, and other special parts were designed.

The Diesels are manufactured on the same automated machining and assembly lines at Ford's Highland Park (Mich.) Tractor Plant which are used to produce the gasoline and LP-gas tractors.



Fuel injection system of the Ford Diesel engine shown schematically. Fuel enters the fuel filter at A, passing through the filter element at B, and emerging through C to the outlet D. Sediment is trapped at E. The Roosa Master injector pump draws fuel in at F, and meters it in sequence to the four Simms fuel injectors through the pressure tubing indicated by G.

Circular inset shows a fuel injector at the compression stroke with the piston at the top of its travel. Fuel enters connector H and travels to point J and K on plunger L. A fluid pressure build-up occurs until the tension of the injector's spring can be overcome, at which time the fuel is injected through four holes into the combustion chamber. Excess Diesel fuel is circulated through the injector pump and injectors to lubricate these assemblies and returns to fuel tank through tubes marked M, N, and O.

LINCOLN'S Power Steering Gear

(*Continued from page 57*)

(the recirculating ball and nut type), a power cylinder, and a hydaulic servo-control valve. The hydraulic valve, valve sleeve, and torsion bar assembly is mounted concentrically at the end of the worm shaft and is operated by the twisting action of the steering shaft on the torsion rod.

The hydraulic servo-control valve actuated by the torsion rod is composed of a sleeve and valve spool. The spool is an open-center-type four-way valve and is held in neutral position by the torsion rod and power spool actuator. The spool is actuated by the twisting of the torsion rod. The amount of twisting of the torsion rod depends on the load on the worm and ball nut. The greater the load, the greater the twisting of the torsion rod. The torsion rod moves the valve spool axially, which allows pressure to be directed to one side of the power piston to give power assistance as required.

Operation of the Steering Gear

In operation, the control valve, which modulates the amount of power assist, is actuated by the torsion rod that connects the steering shaft to the ball nut. The ball nut, with the assistance of the power cylinder, and rack assembly, moves the sector shaft and pitman arm. The steering linkage is actuated by the pitman arm.

When the steering wheel is turned to the right, the ball nut on the worm resists being turned because of the load on the sector shaft due to the front end weight of the vehicle, causing the torsion rod to twist. The torsion rod actuates the valve spool in an upward direction. Movement of the valve spool restricts the oil from entering the left turn side of the piston, resulting in a drop in pressure. Simultaneously, the oil return from the right turn side is restricted, causing pressure build-up. This provides power assist for a right turn.

If the steering wheel is turned to the left, it will cause a similar action but in the opposite direction. The torsion rod actuates the valve spool in a downward direction. The movement of the valve spool restricts the oil from entering the right turn side of the piston, resulting in a drop in pressure. Simultaneously, the oil return from the left turn side is restricted, causing pressure build-up. This provides power assist for a left turn.

As the driver stops applying steering effort to the steering wheel, the valve spool is forced back into its neutral position by the straightening of the torsion rod. When the valve spool is returning to neutral position, the straightening of the torsion rod also helps the front wheels to return to a straight-ahead position.

When the driver turns the steering wheel, the torsion rod twists, causing the control valve spool to move, and the hydraulic system then does the work of steering the car due to metering of hydraulic pressure from one side or the other of the piston in the power cylinder. If the driver holds the wheel in a certain position, there will be a static condition of hydraulic pressure on both sides of the piston.

The resistance of the torsion rod being twisted gives the driver a natural "feel of the road" at all times. The more the torsion bar twists, the greater the power assist in steering. A steering wheel movement of approximately two degrees in either direction will supply the hydraulic power to steer the car. The twist in the torsion rod is mechanically limited to 10 degrees.

When the power unit is not assisting in the steering effort, the valve spool is in neutral position. The oil flows from the pump, through the open center valve and returns to the pump through the worm bearing. Therefore, no area of the valve spool or steering gear is under high pressure in this position.

Pressure at the valve spool is about 30 psi, since the spool, housing, and power piston are full of oil at all times when the engine is running. The new gear has the feature of oil-damping road shock, and, at the same time, the entire gear is self-lubricated.

AUTOMATION News Report

(*Continued from page 59*)

HIG GYROSCOPE

The Navy Vanguard satellite, now circling the earth, was guided into orbit by a new guidance reference system developed by the Aeronautical Div. of Minneapolis-Honeywell Regulator Co.

The guidance "brain," which contains three of Honeywell's "floated" HIG gyroscopes, is located in the second stage of the massive Vanguard rocket.

The guidance system's job is two-fold: it tells the rocket's control system when it has swerved off course because of sloshing fuel, air currents, or other forces; and it "tips" the rocket's trajectory gradually so that the satellite launching vehicle enters a globe-circling course.

Heart of the gyro reference system are the three Honeywell gyroscopes, which are calibrated to a "memorized" heading reference in the three directions of flight—roll, pitch, and yaw.

Known as HIG (hermetic integrating gyros), they weigh about 4.6 lb each, and can measure a motion 3000 times slower than the movement of an hour hand on a watch.

The extreme sensitivity of the HIG is due to its virtually frictionless operation, which is achieved by "floating" the gyro rotor assembly and gimbal in a special fluid instead of using bearings.

If the rocket rotates incorrectly, the gyros will feel the error and send an electrical signal through an autopilot amplifier to the error-correcting servo system at the rocket engines.

Besides sensing errors in heading and sending corrective signals to the autopilot, the system has another important function: to change the pitch heading of the vehicle so that it will slope into an elliptical trajectory around the earth.

This is accomplished by a program timer, which continuously changes the pitch gyro's memory so that it will demand changes in the pitch heading.

FRICTION MATERIALS — TODAY AND TOMORROW

By
Andrew W. Shearer

Manufacturers Meet Challenge to Provide New and Better Materials Required by More and More Rigorous Vehicle Operating Conditions

HIGHER road speeds, engines of increasing horsepower, and heavier vehicles with larger capacities are placing more severe demands upon friction materials each year. The greater operating temperatures and associated problems thus created serve to pinpoint the friction material as a major factor in the design and engineering of passenger cars, trucks, buses, tractors, off-the-road equipment, aircraft, and industrial machinery.

Since the selection of a suitable friction material is a prime element influencing the ultimate power, size, weight, and operational limits of automotive vehicles, a review of the factors to be considered is in order. This will be followed by an analysis of the various types of friction materials, their characteristics, applications, and trends in the field today.

SELECTION OF MATERIALS

There are many variables which must be considered in choosing the type of friction material best suited for a particular application. No single kind of material can satisfy the requirements of all brake and clutch designs operating under conditions that are unique in themselves. One mechanism may be running in a dry atmosphere, while another may be immersed in oil; speeds, pressures, temperatures, torque requirements, etc., will also vary widely from application to application.

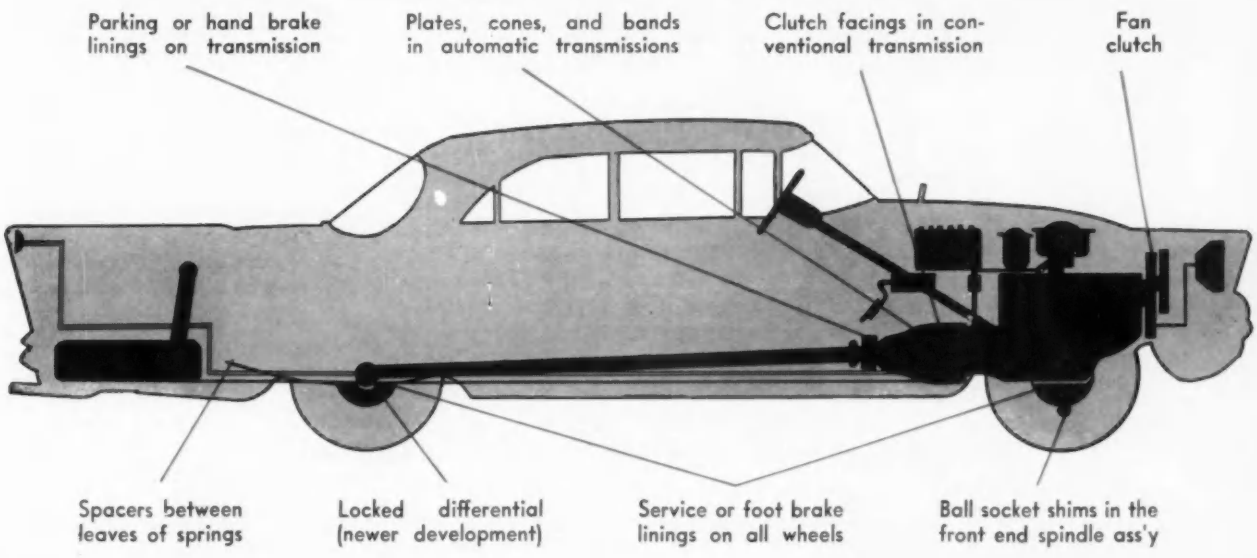
In essence, then, the choice of the right friction material to fill a certain need is a complex problem that is best resolved by cooperation between manufacturer and user. Here, however, are a few general yardsticks to be applied in selecting friction materials:

Coefficient of Friction

Friction materials are usually classified as possessing a low, medium, or high coefficient of friction. Ideally, this should be consistent over the operating range (0.35 to 0.45 in the case of passenger cars) and not be affected by changes in temperature, pressure, or severity of application.

However, in actual operating practice, constant friction stability is difficult to attain. Many types of friction materials undergo either a decrease or an increase in their coefficient of friction at high temperatures. By the same token, many of the organic bonded or molded friction materials show little or no change in friction with pressure, but some of the sintered-metal materials exhibit a decrease in coefficient of friction as the pressure on the lining increases.

"Fading" is the common term used to describe a drop in a material's coefficient of friction and



TYPICAL APPLICATION OF FRICTION MATERIALS IN A PASSENGER CAR

is caused by extreme heat that is generated faster than the brakes can dissipate it. While many organic bonded types of friction materials will fade under severe use, such as a series of high-speed stops, they are considered adequate if they regain their original friction level after cooling. A "grabbing" action results when a material's coefficient of friction undergoes a marked rise.

From the viewpoint of coefficient of friction, the following factors should be borne in mind in selecting a friction material for a particular application: 1) desired initial friction; 2) operating temperatures, pressures, etc., and 3) the allowable variation in friction the material may undergo in operation.

Wear Resistance

The subject of wear is both a broad and important one in the selection of a friction material. It is to the great credit of the friction materials industry that the life of brake linings has soared in the past 10 years to the point where the average automobile driver today can expect a minimum of 20,000 miles wear.

The immediate effect of high temperature in a brake is wear on the brake lining or the drum. The energy and wear on friction elements in stopping a vehicle going about 100 mph are about four times as great as when it is stopped from a speed of 50 mph.

Resin-bonded, molded-asbestos friction materials are capable of high operating temperatures and deteriorate slowly because their thermal insulating qualities are strong. Phenolic resins are popular binding agents because of the excellent heat stability they lend to such materials. While bonded materials with a binder other than a phenolic resin have a lower heat capacity, they still will offer a good life if operating temperatures are maintained below critical points.

There are no internal chemical changes before the melting point is reached in the metallic friction materials, so deterioration comes only from oxidation or physical changes. Other characteristics of these materials, however, may offset their low wear rate advantage.

Smooth and Quiet Operation

Depending on the application involved, smoothness and quietness of operation may or may not be important elements in friction material selection. They are, however, critical factors as far as automotive applications are concerned.

Speaking generally, resilient and flexible materials have better engagement qualities and operate a lower noise level than the semi-rigid and rigid types. Here again, though, it is difficult to set up any definite guideposts to be followed because there is no real standardization of values in friction materials.

Other Considerations

Lack of water sensitivity is another important factor in friction materials for automotive applications. Excess moisture in brakes can result in noise or erratic operation. Since fast recovery of friction in brakes that have been dampened is essential for safe vehicle operation, compounds are incorporated in friction materials to lessen the effects of moisture

and reduce the formation of iron oxides on the drum surfaces.

Any friction material must also, of course, be non-injurious to the mating face. This requirement has been responsible for impeding somewhat the advance of the metallic materials into automotive braking applications, but the problem is under study and gives good promise of imminent solution.

Finally, cost is certainly an important factor in selecting a friction material for such high-volume applications as automotive brake linings, clutch facings, automatic transmission bands and disks, etc. The weights of original equipment friction materials average about 5 to 7 lb in passenger cars and pick-up trucks; 15 to 25 lb in trucks and buses; and range up to 100 lb in off-the-road equipment. While these figures are insignificant as far as total vehicle weights are concerned, they represent a vital cost element to the vehicle manufacturer.

CHARACTERISTICS OF MATERIALS

Although friction materials vary widely in composition and characteristics, they must all have the ability to cause the conversion of energy into heat and then be capable of withstanding the heat once developed without melting, deforming, or oxidizing. They must also have the mechanical properties required to hold up under the pressures and speeds necessary to their function.

A broad range of materials has been developed and made available today to meet specific end uses and operating conditions. Listed below are all of the major types currently offered with their principal characteristics briefly described.

Woven

Woven friction materials have outstanding engagement characteristics and a high coefficient of friction. To date, their use in industrial equipment has been greater than that in automotive vehicles. They are, however, used in off-the-road equipment and other vehicles in muddy, dusty areas and in some automatic transmission bands.

Basically, woven materials consist of a weave of yarn (asbestos-cotton) and wire which has been impregnated, compressed to the desired size, cured, and coiled into a roll. The impregnating agents are formulated from drying oils, thermosetting resins, or combinations of the latter. These materials are also made in rigid segments.

One of the deterring factors in expanded automotive applications of woven materials has been the high cost of spinning the fibers. Since, in addition to offering a nice, soft feel to the driver, there are many other appealing properties inherent in woven materials, this cost problem is receiving keen attention by friction materials manufacturers. There is every reason to expect that their usage in passenger cars, trucks, and buses will expand in the future.

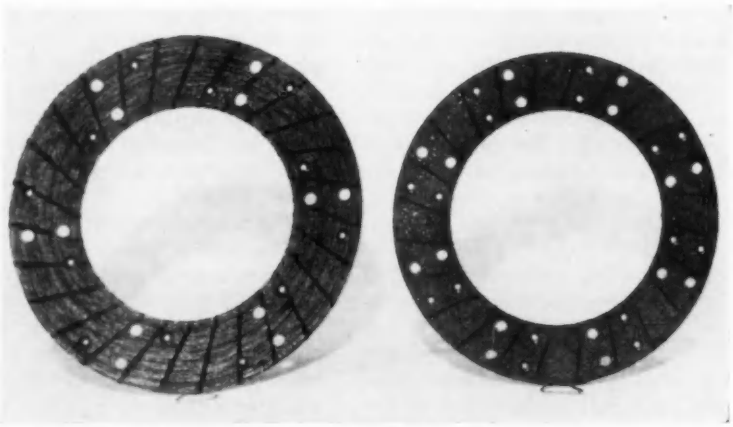
Folded and Compressed

These materials, often referred to along with rubber-coated yarn as being "rubberized", can be used for clutch facings as well as brake linings. Their wear resistance and frictional characteristics are fairly good, but they are not recommended for high-temperature operating conditions.

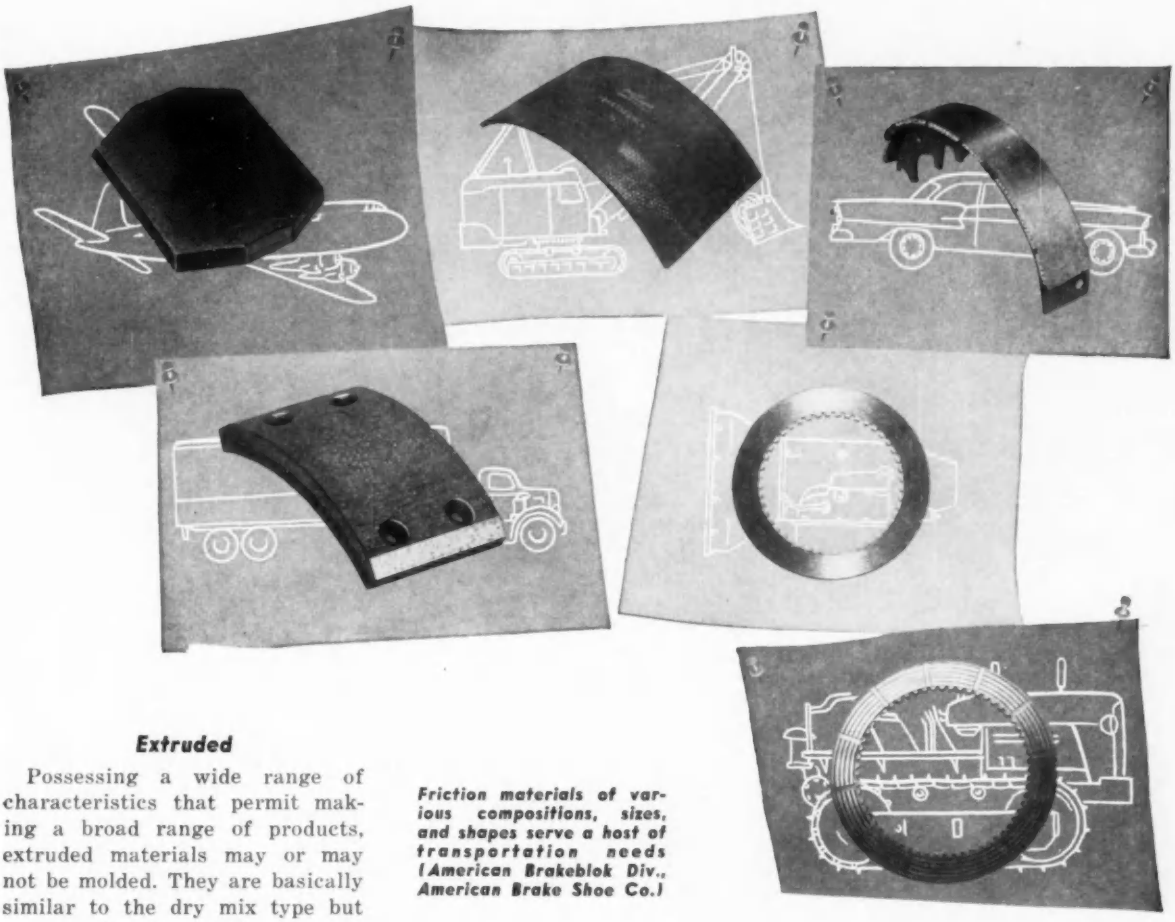
Somewhat akin in composition to the woven type, these fabric materials are impregnated after weaving and drying with a waterproofing solution. Calendering rolls are used to bond a rubber friction compound to the cloth foundation. After the calendered cloth has been folded in layers to the desired thickness, it is cured under heat and pressure to vulcanize the rubber compound in the structure of the material.

Dry Mix Molded

An excellent group of friction materials with a favorable cost factor, the dry mix molded types possess good rigidity, heat stability, wear properties, and engagement characteristics. They are used extensively for brake linings, clutch facings, and as brake blocks for heavy-duty vehicles.



Shown at the left is a spiral wound clutch facing, while at right is a molded type (Johns-Manville Sales Corp.)



Friction materials of various compositions, sizes, and shapes serve a host of transportation needs (American Brakeblok Div., American Brake Shoe Co.)

Extruded

Possessing a wide range of characteristics that permit making a broad range of products, extruded materials may or may not be molded. They are basically similar to the dry mix type but use a liquid bonding agent. Neither their strength nor heat stability is considered to be as good as that of the dry mix linings, but these elements can be "beefed up" by thermosetting bonding resins and careful curing.

Wire-back Types

Similar in composition to extruded linings, wire-back types are widely used for replacement purposes in the passenger car field and are also installed as original equipment on some makes. Wire screen backing is embedded in the friction material during the production process. While these linings have good frictional properties and a reasonable wear rate, they do not have the heat stability of the dry mix materials and are more subject to fade.

Sheeter

Toughness and flexibility are two outstanding characteristics of sheeter-type friction materials. While primarily used in industrial brake linings and clutch facings, one automobile manufacturer uses them almost exclusively.

These materials are made by laminating thin films of a rubber-bonded matrix. While comparatively costly, they have excellent frictional and wear properties.

Millboard

Used mostly for automotive replacement lining and in industrial clutches, millboard friction materials, chiefly composed of short asbestos fibers, do not have the range of versatility of some of the other types. Good engagement characteristics probably constitute their greatest point of appeal; frictional stability, wear resistance, and temperature properties are not as good as those of the molded materials.

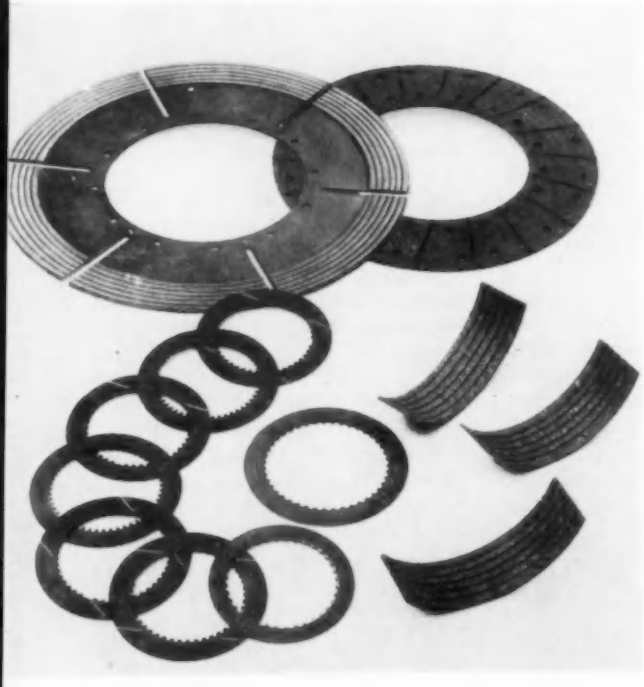
Resilient

Resilient types of friction materials are of varied compositions containing a binder and cork, cellulose, and asbestos as principal ingredients. Woven asbestos friction material, described separately above because of its different properties, is also a member of the resilient family.

In addition to having excellent frictional properties, resilient materials in general have good engagement characteristics; their compressibility causes slow build-up of the applied pressure. Other assets are their natural dampening characteristics tending to prevent chatter, and their low cost.

The resilients are not, however, without their drawbacks. Cork

Shown here are a few of the many friction parts made by Raybestos-Manhattan, Inc., of woven and molded asbestos, cork-cellulose, semi-metallic, sintered metal, and other friction materials.



Brake linings, clutch facings, and automatic transmission disks showing some of the different groove patterns for better friction performance (Raybestos - Manhattan, Inc.)

and cellulose materials char to destruction at temperatures close to 400 F; a relatively low-temperature ceiling for their successful operation is thus imposed. Resilient materials also have a high wear rate due to their low tensile strength and a tendency to undergo a permanent set and loss of resiliency. Frictional stability is likewise comparatively poor. Cork and cellulose material show up to best advantage when operated in an oil system.

Full Metallics

Full metallic friction materials, consist of a sintered metal matrix interspersed with metallic and non-metallic friction modifiers. Due to its weak structure, the material is always bonded to a steel core or backing plate. The most commonly used matrix is a bronze comprised of copper and tin, but may also consist of iron or iron-bronze for lower cost.

These materials are especially suited for oil or dry operation in applications where kinetic energy absorption per square inch of friction material is very high, where engagements occur on a repetitive cycle with little time interval, or where friction components must be held to a minimum thickness.

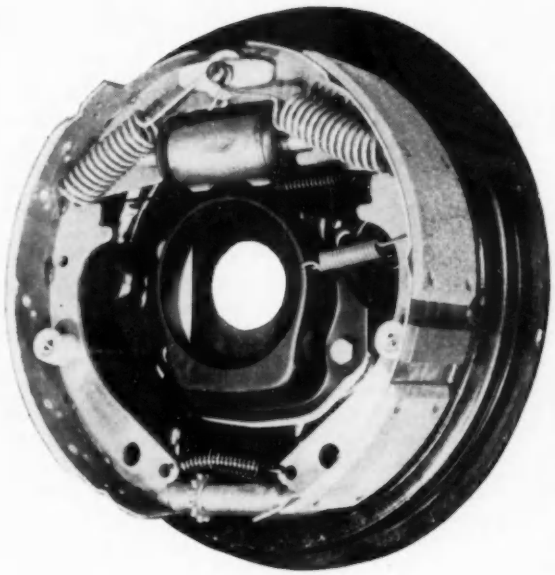
The full metallics are finding a number of broad applications in clutches and steer clutches for industrial and off-highway equipment, and in certain types of automotive automatic transmission units. Their usage as a brake lining material has thus far been generally restricted to heavy-duty vehicle applications.

Automobile manufacturers are, however, taking a closer look at full metallics as braking temperatures near the critical point. Considerable development work is underway on refining them for passenger car use, and smaller brakes for smaller wheels may hasten their adoption. They have already been used on some racing cars.

Good durability and resistance to fade are but two of the advantages of the full metallics as friction materials. They also have good frictional stability and show little drop-off during their life. Disadvantages of the full metallics are high specific gravity, weak structure, low cold coefficient of friction, occasional noisy operation, and bi-metallic warpage when friction material is applied to the steel reinforcing member.

Semi-Metallics

Semi-metallic friction materials contain 40 per cent or more of metal powders, a synthetic resin



Organic bonded cermetallic linings are combined in this illustration of a Cermetalix (Bendix trademark) piece inserted between the organic segments (Marshall - Eclipse Div., Bendix Aviation Corp.)

bonding agent, and various percentages of asbestos, graphite, and friction augmenting agents. Copper is generally the predominating powder, and lead powder is often included for its lubricating properties.

Used primarily in aircraft applications and in automatic transmissions at the present time, properly compounded semi-metallics have excellent engagement characteristics. This is undoubtedly due to the lubricated copper film which develops on the operating surface.

These materials also exhibit good frictional stability and durability under severe operating conditions, although not as great as that of the full metallics. However, the coefficient of friction of the semi-metallics is higher than that of the full metallics.

One of the best advantages of this type of friction material is its ability to be made into thin, conformable sections readily adaptable to such uses as bands, plates, cones and intricate shapes. Semi-metallics have been used experimentally in automotive brake linings, but noise and cost remain major problems.

Cermetallics

These materials are composed of ceramic particles placed in a metallic matrix to overcome their inherent weakness and brittleness. The matrix supports the ceramic particles and conducts heat away from the surface. Additional support is furnished by installing the ceramic-metal (cermet) matrix in a metal holder.

Outstanding heat capacity gives cermetallic materials better resistance to fading than any other friction materials. Due to their ability to operate at temperatures as high as 2000 F (dry), they have made an important contribution toward solving high-energy braking problems in the aircraft industry.

Significant improvements in lower energy applications have resulted in their use on large tractor clutches. Bendix has developed a successful lining for the secondary shoes of the Ford Thunderbird brake that combines a Cermetalix (Bendix trademark) piece with organic bonded segments (see illustration). Passenger car applications for *full* cermetallics, however, do not appear imminent because of noise problems, poor engagement characteristics, and high cost. Considerable developmental work is underway to overcome these difficulties.

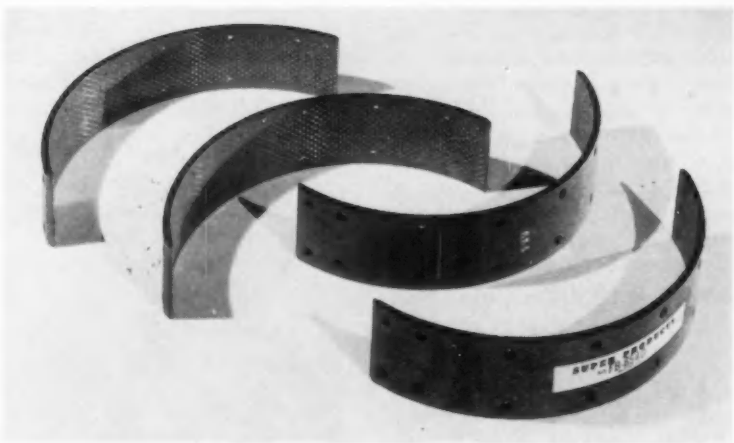
FRICTION MATERIALS IN USE

All of the materials enumerated above, with the exception of certain woven types that have been treated with rubber compounds, may be operated in either dry or oil media. Those favored particularly for use in oil are the resilients, semi-metallics, full metallics, and rigid molded.

Grooving

Grooving of friction materials for both wet and dry applications is a common practice to dissipate heat, reduce wear, improve engagement, and prevent sticking. It is practically a universal procedure as far as materials for operation in

(*Turn to page* 69, *please*)



An array of wire-back brake lining segments (Thermoid Co.)

Wide Diversity of Subjects at SAE NATIONAL MEETING

By Joseph Geschelin

CONSIDERABLE excitement prevailed in Detroit during the course of the SAE National Passenger Car, Body and Materials Meeting, held March 4 to 6. It was concerned not with the meeting but with newspaper accounts of plans to produce small, low-powered high economy cars, claimed to sell around $1600. Although such reports have been current for many months, Detroit newspaper writers insist that several makes will launch these small cars for the 1959 season. While the companies involved neither confirm nor deny at this writing, it is difficult to visualize how they could groom entirely new cars so quickly.

The meeting program covered a diversity of subjects, including car vibration and shake; a session on tire problems; the Buick Flight Pitch Dynaflow and the Dana Limited Slip differential; further material on the AMC six-cylinder engine, Chrysler's new V-8, and the Chevrolet "W" engine. The Materials Activity contributed a session dealing with some recent developments in steel making.

In addition, the Ford organization presented a paper on station wagon styling and another on the market for station wagons. In the latter paper, presented by G. H. Brown, Ford Division, the author estimates that during 1957 about 738,000 station wagons were sold by all producers, making a penetration of some 12.3 per cent of total production. Brown feels that within 10 years, station wagons may account for 25 per cent of total car production.

Brakes

Beyond a doubt, the heaviest attendance at this meeting was accorded the panel session on brakes. All of the speakers agreed that the root of the braking problem in passenger cars is in the heavier duty accompanied by increased temperature in the entire system. Temperature control, means for rapidly dissipating heat, reduction in fade, and faster fade recovery were listed among the factors that require attention right now.

The problem was posed by W. R. Rodger, Chrysler Corp. He showed that increased car weight, smaller wheel size, higher accelerations and faster top speeds all contributed to the need for improving the brake system. What can be done? He suggested development of means for cooling brake drums; and the availability of linings capable of withstanding the increased temperatures.

Brake Size Limit Reached

According to E. E. Wallace, Wagner Electric Corp., the industry has just about reached the limit in the size of the wheel brake system and must seek other ways to improve brake performance. Safety and controlability have been imparted by improvements in components, including the use of heavy duty brake fluid. One new solution is the adoption of what he termed a "ratio changer," an automatic valve capable of properly proportioning fluid pressures to the front and rear wheels. Presumably, this is something his company is developing at this time.

Liquid Cooling of Brakes

Liquid cooling of the brake system as a simple way out of the present dilemma was discussed by C. S. Batchelor, Raybestos-Manhattan Co. Liquid cooling, currently being demonstrated by his organization, is said to eliminate fading, give increased lining life, and may even make possible a reduction in the thickness and weight of brake drums. Cooling is applied through cored copper brake shoes which provide a jacketing for the cooling medium. Road tests indicate that heat balance is restored from panic stops in a matter of seconds. He also drew attention to the possibilities inherent in sintered linings as well as in disk brakes, using small metallic disks.

Cerametallic Brake Inserts

After describing some exceptionally good results with cerametallic inserts in brakes for race cars, R. A. Goepfrich, Bendix Products Div., discussed the Bendix OCM brake system which is being recommended for passenger car use. Here they employ a relatively small rectangular section of cerametallic material in conjunction with an organic lining on the secondary shoe. The lining of the primary shoe remains conventional. This has given excellent results on fading tests, showing rapid recovery. For specific installations, it is necessary to select a suitable kind of cerametallic lining and a special formulation of organic lining.

Special Brake Linings

As a result of intensive testing, H. B. Huntress, American Brake Shoe Co., has turned up some excellent results with the conventional brake system and with standard cast iron brake drums, but using special linings. Best results were obtained through the use of a short section of a special molded

insert in the leading end of the primary shoe and the trailing end of the secondary shoe. This is a molded sintered insert of copper-filled type. The remaining linings are of molded type. This combination has withstood the effects of extreme fading tests with excellent recovery and lining life.

Accelerated Brake Testing

Dr. David Sinclair, Johns-Manville Corp., reported on an extensive research project in their scientific laboratories leading to the development of laboratory instrumentation and procedures for accelerated brake testing without resort to road tests. Suitable dynamometer equipment and electronic instrumentation already are in use and correlation testing now is under way to obtain calibrations for correlating laboratory results with road testing.

Study of Collisions

Continuing their study of head-on collisions, Severy, Mathewson and Siegel of the University of California at Los Angeles arrive at the following conclusions: that the chances of survival are approximately the same in either a unitized body or the conventional car; that the chances of survival decrease with higher speeds of impact; that the chances of survival are greatly increased with the use of a lap-belt. It may be noted in passing that the best chances of survival appear to be in avoiding head-on collisions (Ed.).

Aging Control for Sheet Metal

When it comes to the use of sheet metal for deep-drawn parts which demand a high degree of ductility, E. R. Morgan, Jones & Laughlin Steel Corp., described two different kinds of aging control processes that may be employed. Most important of these is chemical control at the steel mill through improvements in the surface of aluminum-killed steels. Mills also have been working with vanadium additions in the mold, reporting that carefully controlled annealing can produce a non-aging steel. Boron additions have been successful in producing rimmed and capped non-aging steels but they are trickier to handle because of the affinity of boron for oxygen. In any event, both vanadium and boron-treated steels are being produced on a limited scale but require further development.

The second method is through mechanical control. However, it appears that this can mask only yield point effects and cannot control loss of ductility. More recently it has been found that all of the effects of aging can be eliminated by combining chemical and mechanical control without having complete control by either device. This is claimed to augur well for producing non-aging steels in the future.

Means of Increasing Tire Life

Although improvements in the ride as well as greatly increased performance have gone far to make modern motor cars more acceptable to the public, their result has been to reduce tire life, particularly through increased tread wear. According to T. A. Riehl, Goodyear Tire & Rubber Co., increased acceleration, more efficient braking and easier cornering all tend to reduce tread life. Consequently, tire producers must find ways and means of increasing tread life to counter this trend. Among the devices employed to this end are: improved furnace carbon blacks; obtaining a more intimate mixture of carbon black and the polymer; improvements in basic tread stock materials; and better protection of the tread stock.

Reducing Tire Thump

Tire thump is a phenomenon that has given a lot of trouble in recent years. Guy J. Sanders, Armour Research Foundation, studying this problem from the standpoint of thump control by tire shape and has come up with the following conclusions: the criteria for minimum thump is to have a shape and construction which does not permit coincidence of the two natural frequencies with two revolution rate harmonics in the 20 to 35-mph range. This is substantially accomplished in most 14-in. tires. On the other hand, if body panels have a sharply tuned resonance very close to these frequencies, thump level will be amplified. Within a particular car model one of the major variables is in the isolation properties of body mounts. A slight lack of trueness in either the body or frame can upset the designed mount attenuation. Over-tightening the mounts may either reduce or increase the level, depending upon the relationship of mount resonant frequency with the natural frequencies of the tire.

Friction Materials

(*Continued from page* 67)

oil are concerned. In some applications, the grooves serve to wipe the oil from the friction surface and keep coefficient of friction at a peak, while in others they help the flow of oil across the friction surface to aid cooling.

Choice of a groove pattern for a particular application is a difficult job. Not only do different groove patterns in different types of friction materials give widely varying performance results, but the *same* groove patterns in different materials may also yield different results.

Methods of Attachment

The most widely used method for fastening friction material to supporting metal members is riveting. With the exception of Chrysler Corp. and Chevrolet, practically all automobile manufacturers today employ riveted brake linings as original equipment. Standardized rivet sizes range from ⅛ in. shank diameter to ¼ in.

In some cases, friction material is used as a floating member. However, in such instances, material must be carefully chosen for suffi-

(*Turn to page* 94, *please*)

Operation of the
AUTOMATICALLY OPERATED CAR at General Motors Technical Center

RECENTLY an automatically guided automobile cruised along a one-mile check road at General Motors Technical Center, steered by an electrical cable beneath the concrete surface. See AI March 1, page 70. It was the first demonstration of its kind with a full-size passenger car.

The demonstration car, a 1958 Chevrolet, was guided by a combined electronic computer and servo system which takes over human steering control by following a magnetic path produced by low frequency power in the highway cable.

To turn off the road or pass another vehicle, the driver touched a switch on the steering gear which cut back into the manual steering system.

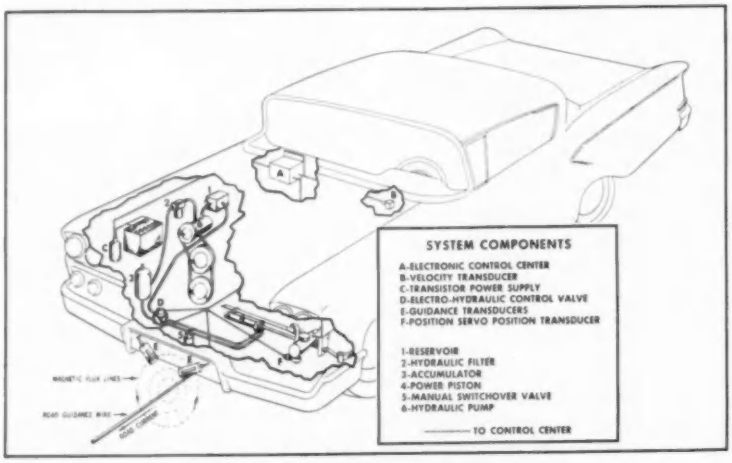
Operation is described below:

Low frequency alternating current in the highway cable creates a circular magnetic field that extends the length of the cable. On the front bumper of the test vehicle is a pair of tuned pickup coils which straddle the cable's magnetic field. As the car follows the magnetic path, the voltage across the terminals of the pickup coils depends on the magnetic field strength. Any deviation or lateral motion of the car causes a difference in voltage from one pickup coil to the other. These voltage variations feed into a small electronic analogue computer on the instrument panel which, in turn, is linked with a servo system that controls the car's modified power steering unit.

In effect, the computer measures the difference in voltage and automatically adjusts the steering onto the magnetic path through the servo system. The computer puts out "command" signals to the servo mechanism which positions the front wheels. Thus, if the car undergoes any rolling, sideslipping or yawing motion — deviations from its straight-ahead course — the automatic steering system brings it back into the straight-ahead path.

Wire in pavement produces magnetic path for guidance system. Two pickup coils on front bumper straddle the magnetic path. Voltage variations between coils feed into electronic analogue computer.

Here is the electronic analogue computer which fits into the glove compartment. Signals from this device control a modified power steering unit.



Schematic diagram of the control system

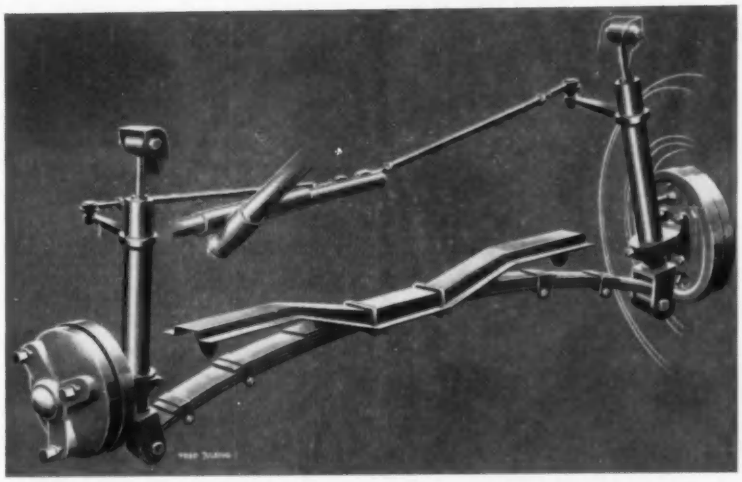
Dutch-Built Small Car Has V-Belt Drive to Rear Axle

The DAF two-door sedan

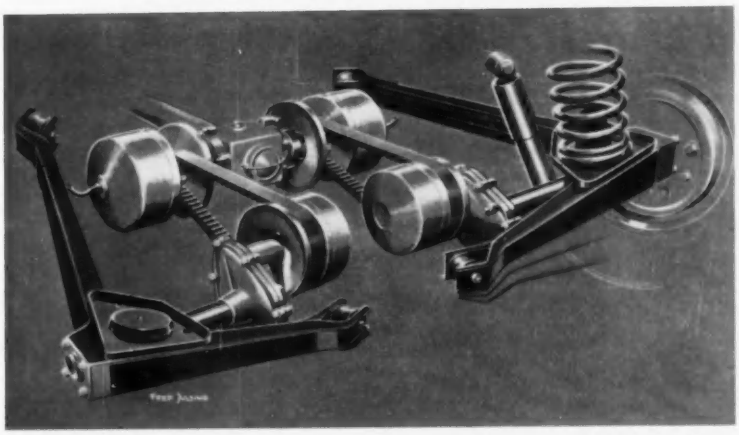
VAN Doorne's Automobiel fabriek (DAF) in Eindhoven, Holland, has announced plans for the production of a small two door-sedan with unitized body, two cylinder, four stroke 22 hp air-cooled engine of 36.7 cu in. displacement, centrifugal clutch and an automatic "Variomatic" transmission employing V-belts. Van Doorne started production of medium size trucks in 1950 and the DAF car is the firm's and Holland's first venture in the small car field. Delivery is slated to begin in the Fall of this year.

Built on a wheelbase of 81 in. the car has an overall length of 142 in., a width of 56 in. and seating capacity for four passengers. Power is transmitted to the 12 in. rear wheels by a centrifugal clutch and two pairs of variable diameter pulleys each connected by a V-belt. Centrifugal weights and engine vacuum control the diameter of the driving pulleys. The diameter of the driven pulleys is governed by spring and belt tension. As both pulleys of each pair have a variable diameter, the transmission has an infinite number of ratios between a low of 20 to 1 and a high of 4.4 to 1.

Suspension is independent both front and rear. Rear suspension employs coil springs and V-shaped control arms pivotally anchored both front and rear. Front suspension consists of a single transverse leaf spring and hydraulic shock absorbers which carry the wheels and act as king pins. The need for chassis lubrication has been eliminated through the use of rubber bushings throughout. Steering is of the rack and pinion type.



In the design of the independent front suspension of the DAF car, the hydraulic shock absorbers carry the wheels and act as kingpins.



The Variomatic transmission of the DAF car consists of two pairs of pulleys connected by V-belts. The diameter of the driven pulleys is governed by centrifugal weights and engine vacuum. Spring and belt tension govern diameter of driven pulleys.

The DAF's car aircooled flat twin engine has an aluminum crankcase and aluminum cylinders with steel sleeve inserts. Bore is 3 in., stroke 2 9/16 in. The compression ratio is 7:1. Mounted beneath the short crankshaft is the camshaft which has two cams actuating the overhead valves of both cylinders through aluminum pushrods. Cooling is by a small fan.

Weight of the car is 1268 lb. Two models will be built, a standard and a de luxe model.

Report from the

FARM EQUIPMENT INDUSTRY

By Kenneth Rose

As the calendar moves to the usual buying season for farm implements, agricultural equipment manufacturers are frankly disappointed at the volume of sales. Normally, sales show an upturn during the months of February and March, starting first in the southeastern and southwestern states, and moving north as the season advances and farmers begin to work the land. This year sales have been considerably below expectations. This is in part due to bad weather over most of the country—disastrous freezes in Florida, unusually cold and wet weather through much of the southeast, excessive rain in parts of the southwest, and temperatures in the midwest and parts of the northwest averaging 10 to 16 deg below normal for the month of February. Whatever the reason, sales of farm equipment have been lagging badly, and manufacturers are cutting back production to bring it into line with sales.

New Tractors

Two new tractors—the 440-IC heavy-duty crawler and the 440-I wheel tractor—highlight the family of new industrial tractors and equipment now being introduced by John Deere. They are completely factory engineered for industrial and woodlands use, with new styling throughout, and new convenience for the operator.

The current "420" Series industrial tractors will be retained in the line.

New equipment being announced by the John Deere Industrial Division includes new loaders for the 440 crawler and wheel tractors, new inside- and outside-mounted bulldozers, a new log arch, and a new side-boom, all to be manufactured by Deere and Company.

Farm Equipment Sales

Although International Harvester had not released its first quarter figures at the time this report was written, company officials admitted that farm equipment sales were down substantially. Bad weather over most of the agricultural areas was blamed, along with uncertainty upon the part of farmers as to the outlook for Government programs. Demands of the unions for layoffs or shutdowns rather than short-time operating schedules have resulted in Harvester's announcing the closing of its Rock Island plant for about six weeks, starting April 26. The Rock Island plant makes large farm tractors. Curtailed production schedules at the Louisville plant for small farm tractors went into effect March 4. The unions insist that men be laid off, and the plant closed down, if necessary, so that they may draw unemployment compensation with supplementary benefits, rather than work a short week.

Deere & Co. released its first quarter report for fiscal 1958, ending Jan. 31, and stated that both sales and earnings were below figures for the corresponding period of 1957. Sales were $73,409,204, compared to $79,295,900 for first quarter of fiscal 1957, and earnings were $4,296,923, against $4,771,788 for a year earlier. Deere officials also blamed excessive rain in some parts of the country for the farmers' setback, but stated that the company is continuing to schedule operations on the basis of sales for the year at about the same level as last year.

Allis-Chalmers Mfg. Co. operates on a calendar year, so that the latest figures available are those for the quarter ending Dec. 31, 1957. Both sales and earnings fell from those of fourth quarter, 1956, but farm equipment sales were higher than those for the comparable period, company officials said.

(*Turn to page* 94, *please*)

Two new John Deere tractors—a crawler and a wheel type

Preview of the 1958 DESIGN ENGINEERING SHOW

THE third annual Design Engineering Show, which is to be held at Chicago's International Amphitheatre from April 14 to 17, will be the largest event of its kind to date. It will have an exhibit area of about 125,000 sq ft —almost 3½ times the size of the first show held during 1956. More than 20,000 visitors, including design engineers and product development engineers from most major companies, are expected.

Concurrently with the Show, the Machine Design Division of the American Society of Mechanical Engineers will conduct a four-day Design Engineering Conference. On the program are leading engineers who will discuss latest design techniques and material utilizations in selected applications.

At the Show some 400 companies will exhibit specialized accessories and materials which enter into the makeup of end products. The displays are valued at more than $10 million and will contain about 12,000 separate items. Among the items to be shown are mechanical, hydraulic, pneumatic, electrical and electronic components; power transmission equipment; metallic and non-metallic materials; fasteners and adhesives; finishes and coatings; and shapes and forms. Engineering equipment and services, as well as fabrication methods, will also be presented.

The Design Engineering Conference, likewise to be quartered at the International Amphitheatre, will consist of eight sessions. The session on the opening day will be a panel discussion on "Putting the Design Into Production." On the following two days, the conference will be divided into two mechanical, two materials, and two power and control sessions.

At the mechanical sessions, the speakers will discuss control devices, automatic inspection, design of automatic machinery, and lubricants for centralized systems.

The materials sessions will cover physical characteristics of plastics, "uncommon" engineering metals, compatibility of bearing metals, and sandwich structures.

In the power and control sessions, electro-hydraulic systems on machine tools and aircraft, and the design of mechanical-electrical servo systems will be discussed.

The closing general engineering session on the fourth day will deal generally with methods for achieving a better exchange of information among engineers. Two papers will be presented on "The Information Center of Tomorrow" and "A Central Catalogue File Saves Engineering Time and Money."

Dr. J. T. Rettaliata, president of Illinois Institute of Technology, is to be the principal speaker at a luncheon meeting scheduled for Tuesday, April 15. His address will have as its subject, "Creativeness—Key to Industrial Progress."

MANY of the new developments to be displayed at the Design Engineering Show are described and illustrated on the following six pages

CONFERENCE PROGRAM

MONDAY, APRIL 14

PANEL SESSION

"Putting the Design Into Production"

Chairman and Moderator—G. F. Norenholt, editor, "Product Engineering"

Vice Chairman—Arthur Socolofsky, Acme Steel Co.

Panel—Leo Kevitt, Alemite Div., Stewart-Warner Corp.; Joseph Manuele, Westinghouse Electric Corp.; D. L. Harwood, Fairbanks, Morse & Co.; and H. W. Regnesburger, Link-Belt Co.

TUESDAY, APRIL 15 (Concurrent)

MECHANICAL SESSION

Chairman—Colin Carmichael, editor, "Machine Design"

Vice Chairman—J. J. Stone, Jr., Battelle Memorial Institute

"Mechanical Memory Devices," Arthur Mirel, American Machine & Foundry Co.

"Automatic Inspection," David H. McConnell, Sheffield Corp.

MATERIALS SESSION

Chairman—H. R. Clauser, editor, "Materials in Design Engineering"

Vice Chairman—J. E. Johnson, Chicago Molded Products Co.

"Shock Resistance of Plastics," G. R. Rugger, Picatinny Arsenal, U. S. Army

"Uncommon Engineering Metals," J. P. Denny and L. F. Kendall, Jr., General Electric Co.

POWER AND CONTROL SESSION

Chairman—F. J. Oliver, editor, "Electrical Manufacturing"

Vice Chairman—T. A. Wetzel, Kearney & Trecker Corp.

"Electro-Hydraulic Systems on Machine Tools," E. J. Rivoira, The Cincinnati Milling Machine Co.

"Electro-Hydraulic Systems on Aircraft," F. L. Moncher and L. D. Taylor, Vickers, Inc.

(*Turn to page* 109, *please*)

What's New at the

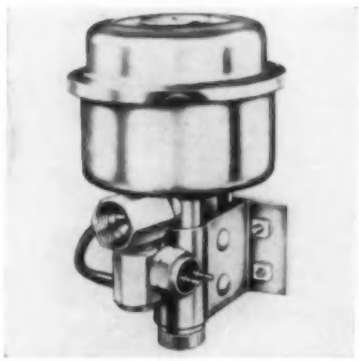
DESIGN ENGINEERING SHOW

International Amphitheatre
CHICAGO
APRIL 14-17

FOR ADDITIONAL INFORMATION
please use reply card on PAGE 89

Lubrication System

The Accumite centralized lubrication system for machine tools and motor vehicles will be shown for the first time. Miniature metering valves service bearings individually. Four different types of lubricant pumps for



Single-stroke vacuum pump for Accumite centralized lubrication system

pressurizing the system and actuating the valves are offered. Power for the single-stroke vacuum pump is obtained from the intake manifold of gasoline engines, and the pump will serve up to 40 bearings. In industrial installations with long lubricant lines, an air operated reciprocating pump will serve as many as 200 bearings. *Alemite Div., Stewart-Warner Corp., Booth 311.*

Circle 25 on postcard for more data

Laminates

Printed circuit base materials, including copper-clad laminates and flexible tapes; a range of supported and unsupported Teflon materials; heat-resistant laminates and molded products; and flame-retardant laminates are to be featured by Continental-Diamond Fibre.

The new heat-resistant laminates and molded products have application in missiles, aircraft, and industrial equipment where operating temperatures of 3500 F are encountered for limited periods. They are said to retain an exceptionally high percentage of their mechanical properties after exposure to elevated temperatures for short periods of time.

The flame-retardant grades are usable at continuous operating temperatures up to 300 F and at higher intermittent operating temperatures. *Continental-Diamond Fibre Corp., Booth 1086.*

Circle 26 on postcard for more data

Ball Bearing Screw

Saginaw will exhibit a new miniature ball bearing screw with only 3/16-in. ball circle diameter. Designed for high efficiency in critical control

Saginaw miniature ball bearing screw

applications, it is said to be so precise that it will position components to within 0.0005-in. for each inch of travel. *Saginaw Steering Gear Div., General Motors Corp., Booth 434.*

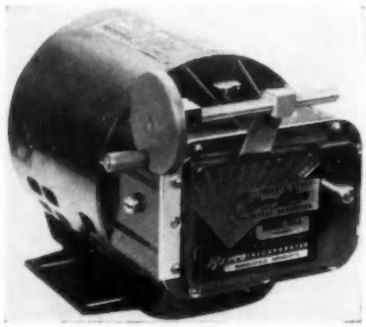
Circle 27 on postcard for more data

Spring Designs

Design of springs will be the theme of the Associated Spring Corp. exhibit. One section of the display will contain a graphic presentation of basic spring design principles. This will be supplemented by a number of side-by-side comparisons of springs as they were originally designed and as they were subsequently redesigned to improve performance or lower manufacturing cost. In addition, spring engineers of the corporation will be on duty to discuss spring design problems and demonstrate use of the corporation's spring-design slide rule. *Associated Spring Corp., Booth 837.*

Circle 28 on postcard for more data

Variable Speed Reducers



Revco will display a line of speed reducers including the Model M14 Zero-Max unit with screw control. It has a torque rating of 10 lb-in. and a variable speed range of from 0 to 400 rpm. (Revco Inc., Booth 1067)

Circle 29 on postcard for more data

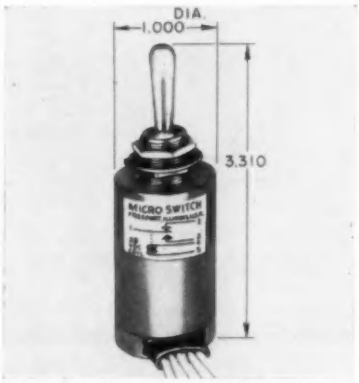
Cellulose Finishes

New cellulosic finishes fusion-bonded to metal parts will be shown by National Polymer. The new finishes join the family of Corvel powdered resins specially processed for use with the Whirlclad process, a fluidized coating process available under license. Parts to be finished are preheated and dipped into a "fluidized" bed of dry coating powders which bond by fusion onto the surface of the part. Heavy coatings from 8 to 15 mils can now be obtained in a single dip, providing durable and attractive finishes. *National Polymer Products, Inc., Booth 653.*

Circle 30 on postcard for more data

Precision Switches

Snap-action, mechanically-operated switches, magnetically-operated static switches, mercury switches, and manually-operated pushbuttons, toggles and rotary selectors will be displayed



Magnetic hold-in toggle switch

by Micro Switch Div. Typical unit is a sealed, momentary action toggle switch which can be converted to a maintained-contact switch by means of a built-in solenoid. *Micro Switch Div., Minneapolis-Honeywell Regulator Co., Booth 960.*

Circle 31 on postcard for more data

Super Alloy Tubing

A line of super alloy tubing comprising 16 different analyses will be shown by Superior Tube. The line is limited to heat-resistant alloys which will not rupture under a stress load of 25,000 psi at 1200 F during a 1000 hour test period. Both seamless and Weldrawn tubing is furnished in a size range of 0.012 to 1.125 in. OD. Applications include those in the rocket, missile and supersonic aircraft industries. *Superior Tube Co., Booth 628.*

Circle 32 on postcard for more data

Production Brazing

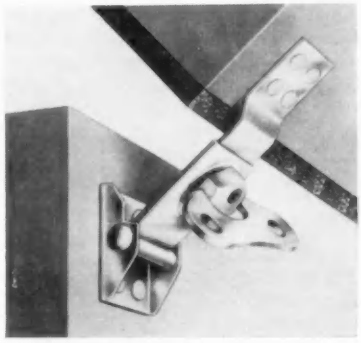
Assemblies of stampings and screw machine parts joined by brazing will be demonstrated in the Handy & Harman exhibit. Featured will be the high-speed production of impeller assemblies, used in a line of power tools, from a machined hub and stamped steel impeller blade. The impellers will be brazed on an automatic gas-air machine, capable of turning out one impeller every six minutes. The machine, designed specially for the show, will automatically feed the Easy-Flo silver alloy to the joint during the heating cycle.

New types of brazing alloys for joining aluminum and heat-resistant alloys will also be shown. *Handy & Harman, Booth 206.*

Circle 33 on postcard for more data

Pressure Hinge

Newest product of Simmons to be displayed is the Hinge-Lock, a high-strength pressure hinge which provides a means of applying pressure along the hinge-line of hinged-cover containers and equipment cases. It is said to insure a tight seal where gas-

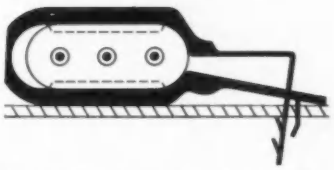


Simmons Hinge-Lock in open position becomes a free-opening hinge

keting is used. Positive locking is accomplished by hand by a half-turn on the wing nut. When pressure is released by a counter turn, the device becomes a free-operating hinge. *Simmons Fastener Corp., Booth 1020.*

Circle 34 on postcard for more data

Wire Fastener

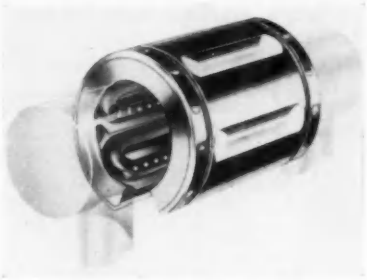


To be displayed for the first time, the Tinnerman Speed Clip wire fastener can be either latched on the wire alone or locked into a panel. Pre-positioning on the wire is possible by compressing to the first locking position. It can secure a single cord or multiple wire harness from 0.75 in. diam to 0.306 by 0.515 in rectangular section. (Tinnerman Products, Inc., Booth 326)

Circle 35 on postcard for more data

Linear Ball Bearing

Several types of linear anti-friction bearings will be displayed by Thomson, including an open type ball bushing for support members along the



Thomson open type ball bushing

length of long shafts. Open construction permits adjustment of bore diameter by use of setscrews or other clamping arrangements. The bearing is made for shaft diameters ranging from one to four inches. *Thomson Industries, Inc., Booth 132.*

Circle 36 on postcard for more data

Conveying Equipment

Link-Belt's participation in the show will be highlighted by exhibits of the company's line of power transmission and conveying equipment. Of interest to engineers will be an operating display of P.I.V. variable speed drives, the new Motogear, and self-aligning bearings. In addition, there will be displays of Link-Belt's ball and roller bearings; babbitted bearings and takeups; roller, silent and other chains used for power transmission. Visitors to the booth will also see the latest geared flexible coupling line. *Link-Belt Co., Booth 983.*

Circle 37 on postcard for more data

Aluminum Products

Alcoa will present a variety of aluminum products both in sample and product form. Among these will be sand castings, die castings, permanent mold castings, forgings, and extrusions, as well as pattern, perforated and expanded sheet. Alumilite, porcelain enamel, and paint and lacquer finishes on aluminum will also be displayed. *Aluminum Co. of America, Booth 618.*

Circle 38 on postcard for more data

What's New at the

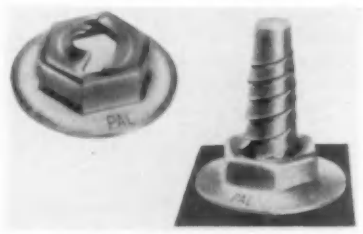
DESIGN ENGINEERING SHOW

International Amphitheatre
CHICAGO
APRIL 14-17

FOR ADDITIONAL INFORMATION
please use reply card on PAGE 89

Self-Threading Nut

A self-threading lock nut which forms its own threads on straight or tapered unthreaded studs, rods, etc., of steel, zinc, aluminum or brass, will be



Palnut self-threading lock nut

featured by Palnut. Made of spring-tempered steel, it is comprised of a thread-forming lock nut and flat washer in one piece, available in sizes for ⅛, 3/16 and ¼-in. studs and either plain or with bonded-in plastisol sealer. *The Palnut Co., Booth 463.*

Circle 39 on postcard for more data

Magnesium Applications

Dow Chemical will display various magnesium forms and assemblies that are in use in the aircraft and missiles and military vehicular industries. These will include the load-bearing platform for the Army's Mechanical Mule weapons and cargo carrier, fabricated entirely from magnesium extrusions. This 70-lb platform will support loads of 1000 lb. Among the aircraft applications to be demonstrated will be floor beams for the Douglas C-133 cargo transport extruded from magnesium pellet material. More than 4000 lb of these extrusions, which are said to offer as much as 40 per cent higher compressive yield strength than conventional magnesium extrusions, go into each C-133. Missile uses of magnesium to be exhibited will include a model of the Hughes Falcon air-to-air missile, constructed of more than 90 per cent magnesium, and a model of the Bomarc missile, which makes extensive use of magnesium-thorium sheet, extrusions and castings. *The Dow Chemical Co., Booth 614.*

Circle 40 on postcard for more data

Rivet, Lockbolt Gun

To be demonstrated will be the newly designed Cherry G-85 rivet gun which can be used to install both lockbolts and blind rivets. (Townsend Co., Booth 971)

Circle 41 on postcard for more data

Industrial Brakes

Two lines of Wagner products will be featured, consisting of industrial brakes, actuators and controls, as well as electric motors.

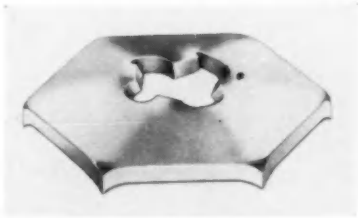
In the brake line, there will be a demonstration of the type HM-3 hydraulic braking system that has a spring-applied hydraulically-released parking brake under control of the operator. Power interruption does not cause the brake to set, as is purposely the case with the Wagner HM-2 system. The HM-3 system was designed for use where frequent momentary power interruptions occur.

Various hydraulic and air actuators and controls for use on industrial machinery will likewise be displayed. In the motor line there will be general-purpose motors, fractional and integral horsepower, and hermetic motors. Resilient mounting of small integral horsepower motors will be a featured item. *Wagner Electric Corp., Booth 558.*

Circle 42 on postcard for more data

High-Strength Lockwasher

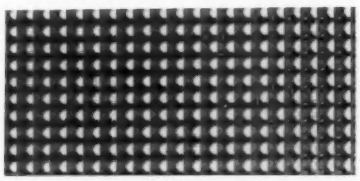
In the Shakeproof exhibit will be a new high-strength lockwasher for heavy-duty applications. It was originally designed for locking automobile body bolts; and is applicable where high torques are required. The pyramidal washer for a ⅜-in. bolt will withstand a torque of 500 lb-in. Four-sided and six-sided washers in several screw sizes are available. They can be preassembled onto screws. *Shakeproof Div., Illinois Tool Works, Booth 522.*



Shakeproof high-strength lockwasher

Circle 43 on postcard for more data

Rigidized Metals

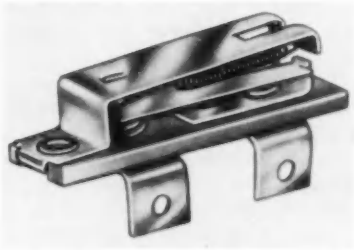


Four new patterns of Rigid-tex metal will be introduced at the show, including the 2-PI illustrated. The company will also announce that pattern 5-WL is now available in sheets up to 52 in. wide. (Rigidized Metals Corp., Booth 332)

Circle 44 on postcard for more data

Sub-Miniature Switch

Feature of the Cherry exhibit will be a new snap-action switch, S70-00A series, for printed circuit and remote control applications. Its mounting pro-



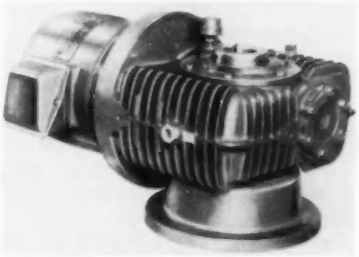
Cherry S70-00A snap-action switch

vides for both electrical connection and mounting in one operation. Rated six amperes at 125-v ac, size of the switch is 1 by 9/32 by ¼ in. *Cherry Electrical Products Corp., Booth 309.*

Circle 45 on postcard for more data

Flanged Gearmotor

First public showing will be made of a new Cone-Drive vertical shaft mounted gearmotor, designed for flange mounting to the driven machine. Capacities range from ¼ to 25 hp. It is available in 27 output speeds



Cone-Drive flange-mounted gearmotor

from 525 to 7.3 rpm, with a 1750-rpm input. Heavy duty tapered roller bearings provide bearing support for both gearing and driven shaft.

Other Cone-Drive products, including additional gearmotors, speed reducers and double-enveloping worm gearsets, will also be shown. *Cone-Drive Gears, Div. Michigan Tool Co., Booth 823.*

Circle 46 on postcard for more data

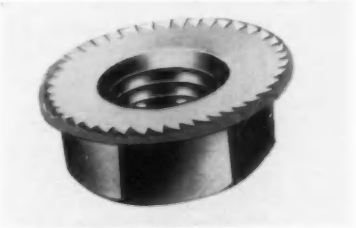
Cold Heading

The use of cold heading for cost reduction will be featured in the John Hassall booth. Enlargements of cold-headed parts that have cut production costs, together with accompanying case history information, will be presented. There will also be mounted displays of parts produced by this method. Samples of cold-headed items, such as rivets, threaded members, double-headed components, machine parts, etc., will be available to interested visitors upon request. *John Hassall, Inc., Booth 946.*

Circle 47 on postcard for more data

Lock and Weld Nuts

One-piece lock nuts with a built-in locking feature will be shown by MacLean-Fogg. Called Spin-Lock, their ratchet-like toothed structure



MacLean-Fogg Spin-Lock nut

bites into the mating surface upon tightening.

This company will also display its Two-Way lock nuts that have their locking power in the body of the nut; as well as two weld nuts which feature ease of assembly. *MacLean-Fogg Lock Nut Co., Booth 504.*

Circle 48 on postcard for more data

Silicone Products

The latest in silicone products and applications will be shown by Dow Corning. Featured exhibits will include a full-size automobile tire molded of Silastic silicone rubber as an early step toward the development of high-temperature aircraft tires. It is said to have been proven capable of "storage" in supersonic aircraft at temperatures as high as 500 F.

Among other featured exhibits will be a five horsepower motor which ran over 60,000 hours at 464 F; a display demonstrating the non-adhesiveness of silicone-coated papers; and weathering samples which have survived, unchanged, as much as five years' exposure. *Dow Corning Corp., Booth 410.*

Circle 49 on postcard for more data

Small Relays

Two new crystal-case size relays that employ a dual coil permanent magnet circuit to obtain high shock and vibration resistance will be presented by Potter & Brumfield. Designated the SC and SL, they measure 0.359-in. wide by 0.875-in. high by 0.795-in. deep, and weigh only 17.5 grams. The SC acts like a single coil relay; operating when power is applied and releasing when power is removed. The SL is a magnetic latching relay that operates on one watt, three millisecond pulses. A short pulse to either coil switches the contacts and the magetic latch holds the contacts in position. When the second coil is pulsed the contacts return. These units are dpdt relays capable of switching two amperes at 30-v dc or one ampere at 155-v ac resistive. *Potter & Brumfield, Inc., Booth 531.*

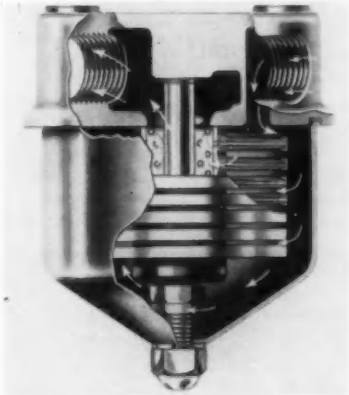
Circle 50 on postcard for more data

Add-Subtract Counter

An add-subtract counter that provides accurate count control between two limits will be shown in the Eagle booth. Pulses may be fed into the unit to provide automatic control for conveyor systems, inventory systems, automatic storage hoppers and similar equipment. The counter has 10-amp contacts and is available in 115 or 230-v, 60 cycles. *Eagle Signal Corp., Booth 301.*

Circle 51 on postcard for more data

Micronic Liquid Filter



Air-Maze will show cleanable micronic liquid filters for removing up to 98 per cent of particles 10 microns and larger. They are made of wire mesh arranged in the form of multiple disks. (Air-Maze Corp., Booth 846)

Circle 52 on postcard for more data

What's New at the

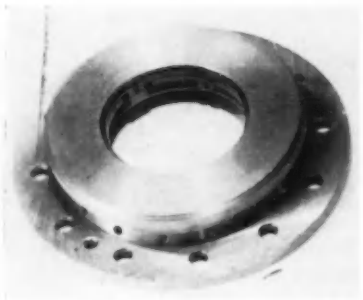
DESIGN ENGINEERING SHOW

International Amphitheatre
CHICAGO
APRIL 14-17

FOR ADDITIONAL INFORMATION please use reply card on PAGE 89

Mechanical Seals

A line of mechanical seals with applications in gas turbines, rocket engines, accessories and auxiliary units, will be included in the Cleveland



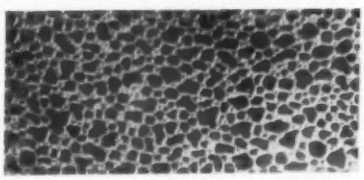
Cleveland Graphite mechanical seal

Graphite Bronze display. Sizes vary from 0.250 to 13-in. diam for shafts running at speeds up to 80,000 rpm, and they can accommodate pressures of 1200 psi. *The Cleveland Graphite Bronze Co., Booth 910.*

Circle 53 on postcard for more data

Embossed Aluminum

Feature of the Fairmont exhibit will be the company's line of embossed pattern aluminum, usable as decorative panels. It is available in three



Fairmont Pebble embossed aluminum

patterns, designated Pebble, Stucco and Square, and in widths up to 36 in. Thicknesses range from 0.024 to 0.102 in. on the Pebble pattern, from 0.010 to 0.064 in. on the Stucco, and from 0.019 to 0.040 in. on the Square pattern. The material offers added rigidity and a permanent finish which resists damage during fabrication and in use, in addition to attractive appearance. *Fairmont Aluminum Co., Booth 980.*

Circle 54 on postcard for more data

Motor Starter

Among a full line of general-purpose control devices exhibited in the G. E. booth will be a new manual starter, using a fast-plug-in heater, for single-phase motors up to one horsepower. Overload protection is provided by a bi-metallic thermal mechanism that automatically opens the contacts when an overload occurs. The plug-in heater simulates the motor's temperature and causes a bi-metallic strip to bend. This strip is designed to not trip the mechanism on momentary overloads, such as starting currents, but will guard the motor against persistent overloads. Under overload conditions, the bi-metallic mechanism is trip-free so that contacts cannot be re-closed until the strip cools. *General Electric Co., Booth 872.*

Circle 55 on postcard for more data

Self-Locking Nuts

The ESNA booth will highlight new products introduced during the past year. A group of miniature self-locking nuts designed to meet demands for miniaturization of all components will be illustrated and demonstrated. These include new "fixed" and "floating" anchor type fasteners in various configurations, as well as the latest addition to the miniature line, the flush-mounting clinch nuts. These clinch nuts are available in both the nylon insert and all-metal types. The temperature limitation on the insert type has been raised to 350 F by use of heat stabilized nylon.

A new series of high tensile fasteners will also be on display. These self-locking nuts were designed for use on bolts with tensile ratings up to 220,000 psi. *Elastic Stop Nut Corp. of America, Booth 937.*

Circle 56 on postcard for more data

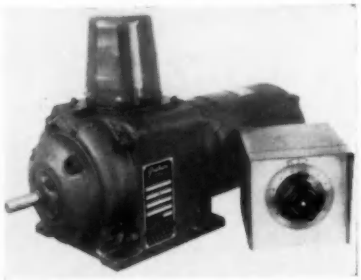
Roller Bearings

Precision type radial roller bearings, thrust roller bearings, and special aircraft roller bearings will be exhibited by Rollway. Races and rollers of the radial bearings are generally of SAE 52100 steel or variations of 52100, such as No. 1 and No. 2 chrome. Maximum variation in the rollers in any one bearing is said to be 0.0001-in. in diameter and 0.0003-in. in length. Races and rollers are through hardened to a hardness of 59 to 63 Rc. The cage is a two-piece, roller riding, bronze retainer. *Rollway Bearing Co., Booth 673.*

Circle 57 on postcard for more data

Variable Speed Drive

A variable speed drive and remote electrical control, featuring a vernier dial setter, will be demonstrated by Graham, along with a line of systems



Graham transmission with remote control

for automatic control of variable speed systems with speed set in proportion to a signal from any electrical transducer. *Graham Transmissions Inc., Booth 449.*

Circle 58 on postcard for more data

Stainless Steels

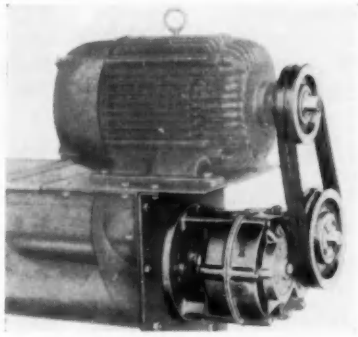
Precipitation hardening stainless steels, including PH 15-7 Mo, the newest member of the line, will be featured in the Armco exhibit. Other types to be shown are 17-7 PH and 17-4 PH. Parts and photographs demonstrating Ryan Aeronautical Company's use of the 17-7 PH stainless steel in award-winning designs will be presented.

Another feature of the exhibit will be typical applications of Armco aluminized steel for corrosion resistance. *Armco Steel Corp., Booth 917.*

Circle 59 on postcard for more data

Screw Conveyor Drive

A screw conveyor drive, simple to mount on standard conveyor troughs, will be exhibited by Dodge. The unit consists of a speed reducer with pack-



Dodge screw conveyor drive

ing gland and driving shaft, which mounts on the trough end.

Timken bearings are used throughout the drive to provide ample thrust and radial capacity. Design insures protection against invasion by the material being handled by the conveyor. The drive comes in four sizes, and each size is offered in 18 to 1 and 8 to 1 ratios. *Dodge Mfg. Corp., Booth 1077.*

Circle 60 on postcard for more data

Magnetic Conveyor Rolls

Non-electric magnetic conveyor rolls will be shown by Eriez. Called Magna-Rolls, they come in a range of sizes from 2½ through 30 in. diam. Each roll is obtainable in the magnetic strength and depth of field needed for a given application.

They are designed for use as head or tail pulleys, for holding, controlling or elevating ferrous parts, receptacles, boxed metal pieces, rods, bars, pipes and steel sheets. *Eriez Mfg. Co., Booth 1050.*

Circle 61 on postcard for more data

Sealing Fastener

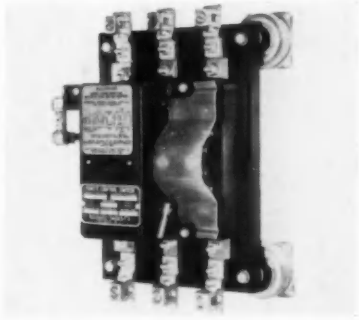
Spin-Seal is the trademark of a new sealing type fastener which is to be presented by Russell, Burdsall & Ward. It consists of a spring type hardened washer with a flowed-in polyvinyl-chloride-base-compound gasket sealant, that is preassembled to any standard screw. The device is said to provide a seal on irregular, corrugated or curved surfaces, as well as on flat surfaces.

Cold heading of threaded and unthreaded small and medium size metal parts (maximum length about six inches), as a means of cutting production cost, will be a featured subject in this same exhibit. Typical parts and applications will be displayed, along with data giving examples of savings and improved strength made possible by this process. *Russell, Burdsall & Ward Bolt and Nut Co., Booth 986.*

Circle 62 on postcard for more data

Remote Control Switch

Remote control switches equipped with vibration mounts and contained in soundproof enclosures will be in the ASCO display. Designed for ap-



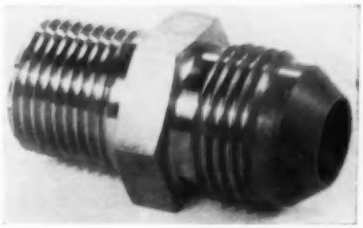
ASCO soundproof remote control switch.

plications where quiet operation is essential, they are used to provide convenient and accessible control of power and lighting circuits from any number of central stations. They respond only to control of pushbuttons. *Automatic Switch Co., Booth 481.*

Circle 63 on postcard for more data

Tube Fittings

Triple-lok tube fittings, having a specially treated flare nose to provide a connection able to hold helium, will be featured in the Parker display. The treatment consists of a thin coating



Parker-Hannifin tube fitting

of DuPont's Teflon to fill normal tool marks and other invisible irregularities in the machined surface. *Parker-Hannifin Corp., Booth 118.*

Circle 64 on postcard for more data

Stress Analysis

Magnaflux will have working demonstrations of several products developed to aid design engineers. These include Stresscoat, Stresscoat All-Temp, Magnaflux, and Zyglo. Stresscoat All-Temp broadens the usefulness of the brittle coating method for stress analysis by permitting tests over a temperature range of from −35 to +700 F. It is fired on parts at about 1000 F. *Magnaflux Corp., Booth 433.*

Circle 65 on postcard for more data

Position Control

Information will be available on a position or link synchronization control system at the U. S. Motors booth. It permits variable speeds of assembly or production conveyors on those applications where position synchronization between two conveyors is required.

Position control facilitates loose assembly or transfer of parts from one conveyor to another. It assures that parts or transfer hooks, carried by a lead conveyor, and matching parts, carried by a follower conveyor, reach a transfer point at the same time. This eliminates manual parts transfer from follower to lead conveyor. *U. S. Electrical Motors Inc., Booth 212.*

Circle 66 on postcard for more data

News of the MACHINERY INDUSTRIES

Versatile New Machines Developed for Economical Production of Heavy Steel Roadbuilding Equipment Components in Small Lots

By Charles A. Weinert

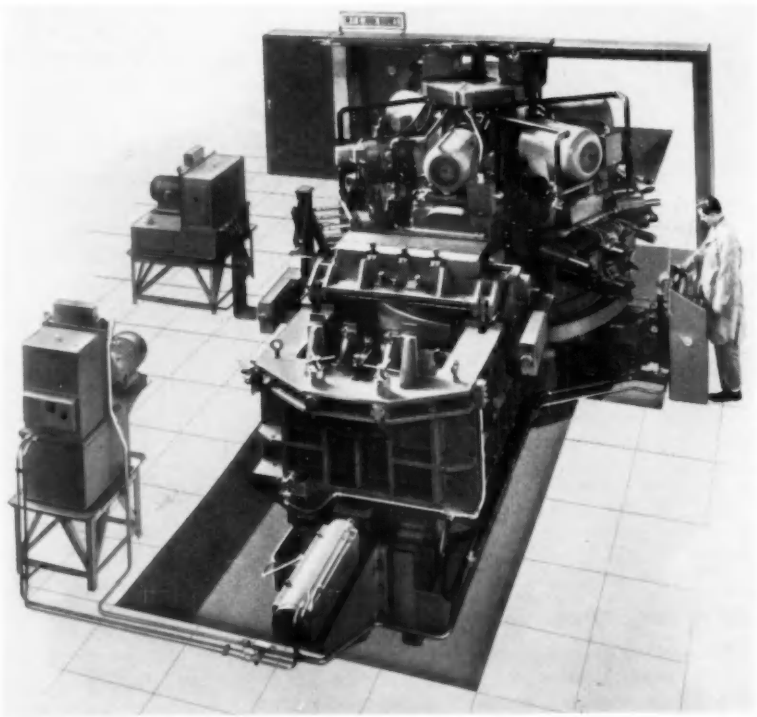
Barnes Special Machines for Roadbuilding Equipment Parts

A group of six special-purpose machines incorporating some new design features was recently shipped by W. F. and John Barnes Co. to an eastern manufacturer of roadbuilding equipment. To obtain economies in processing heavy steel components in small lots, four of the six machines are of the turret type in which a rotary table carrying several multi-spindle heads can bring these heads successively into working position. The spindles carry tools to do drilling, reaming, chamfering, boring, and tapping.

By combining a number of operations in one machine, savings in cost of machine tools, in floor space, and in processing are obtained. Because of the small-unit-volume requirements, several of the machines are also designed to process more than one part. Another feature is the use, on one machine, of two workholding fixtures — one each side of the rotary table—so that cases can be drilled and tapped on one fixture and the same tool arrangement used to drill the covers for these cases, mounted on the other fixture.

The No. 1 machine of the group is a six-station turret-type drilling, reaming, chamfering, and tapping unit, with six multi-spindle heads mounted on a rotary - indexing table. Work is held in a shuttling fixture that feeds it inward to the horizontally-operating cutting tools held in the spindles. This machine is set up to process three different welded-steel cases and three different covers for the cases. The machine base is made in two sections—one for the table and the other for the fixture saddle. The table is 96-in. diam, weighs about 40 ton, is hydraulically moved, and has a power-operated indexing pin. The fixture saddle is mounted on 40-in. ways, has hydraulic positioning and feed, and holds any one of three replaceable fixtures in which the workpieces are mounted for processing. Workpieces are manually loaded into the fixture with the aid of a hoist, and are manually clamped.

The No. 2 machine is of the turret type, with two five-station rotary-indexing tables—one each side of the workholding fixture. Its base is made in three sections—one for each table and one in between for the fixture saddle. This machine drills, reams, chamfers, and taps three sizes of welded-steel case. Hydraulically-actuated feeds give fixture movement in both directions, enabling the workpieces to be processed on both sides. Provision for an additional fixture base was made on the outer side of each rotary table section. The machine



The W. F. and John Barnes drilling, boring, chamfering and tapping machine pictured is No. 3 of six special-purpose units recently built for processing roadbuilding equipment parts. It has six-turret-type multi-spindle heads mounted on a rotary indexing table, and two fixture saddles that feed the workpieces in from both sides.

can therefore be expanded to provide for three fixtures and saddles, with two turret tables, should the need arise.

In the No. 3 machine (illustrated), a six-station turret-equipped rotary-indexing table is mounted between two workholding fixtures, so that cases and covers can both be processed at the same time with suitable cutting tools mounted in the respective spindles. The machine drills, bores, chamfers, and taps three different welded-steel cases, and two sizes of covers.

The No. 4 machine, similar in arrangement to No. 1, has a four-station rotary-indexing table that is turret-equipped, and one workholding fixture. It drills, bores, chamfers, and taps two sizes of gear covers. As with the other machines, fixtures are manually loaded and clamped.

The No. 5 machine is a five-station unit having two dual-spindle horizontal heads and three multi-spindle vertical heads. The heads are arranged in-line, instead of being mounted on rotary tables as in the case of the first four machines of the group. This machine mills and drills four different welded-steel roller frames, held in a fixture on a saddle that moves along horizontal ways to successive stations, located by wedge relief index pins.

The No. 6 machine is a seven-station drilling, boring, chamfering and tapping unit equipped with horizintal heads on both sides of the transfer mechanism. It will process two different cast-steel frame parts held in a fixture mounted on a saddle. The saddle can be driven backward or forward, and is power-indexed by a gear-head clutch-brake motor driving heavy roller chains. As the parts to be processed are right-hand and left-hand, the fixture is made so that it can be turned 180-deg from one position to the other.

Buhr Is Optimistic About Future Outlook

At a recent press conference held at Buhr Machine Tool Co., Ann Arbor, Mich., J. H. Buhr, president, outlined some of the important developments in the business of his company. Buhr has made a number of plant additions during the past two years to provide needed space for assembly and machining operations. This allows more room for the erection of transfer machines and aids in reducing the lead time in building such equipment.

Buhr views the future with a great deal of optimism in view of the major changes in passenger car running gear elements anticipated in the near future. Moreover, at the present time the company's order backlog amounts to five or six months, a better situation than that of some other machine tool builders.

Objectives of the company are to reduce the lead time on delivery of transfer machines; to consistently produce better quality; and to minimize the time in setting up new machines and tuning them for maximum production. In addition, Buhr is giving special attention to the development of special assembly machines. Several of the large transfer machines now being completed feature a new type of General Electric electronic control system, called the Pan-A-Trol. Eventually, Buhr anticipates that GE can supply panels completely wired and ready for use as received, thus eliminating the need for producing and wiring control panels by the machine tool builder.

Despite the nature of business today, Buhr has been receiving a considerable volume of inquiries for new equipment. Company officials feel the need for diversification, and say that inquiries, currently, are running around 60 per cent automotive and 40 per cent other industries including farm machinery builders.

Uniform Lease Rules Formalized by ODM

Last month the Office of Defense Mobilization issued an order which consolidates, in a single document, policy guidance to Federal agencies on the use and leasing of Government-owned production equipment. The document, issued as Defense Mobilization Order VII-4, revised, supersedes an order dated October 9, 1953, and all subsequent amendments and supplements.

Defense Mobilizer Gordon Gray said that the new order clarifies but does not change recent policies. It will be recalled that ODM, during the latter part of 1957, established uniform rental rates and leasing practices to be followed by all Federal agencies in leasing equipment to private industry. These, in turn, were based on the recommendations of a special interagency group which had earlier made a study of equipment-leasing practices of the Government.

Around the Industry

The Cyril Bath Co.—Frank J. Phillips has been named vice-president and general manager. Mr. Phillips was sales manager since 1952 and a director since 1956. He now fills the position held by Richard Humiston, former executive vice-president, who resigned in January, 1958.

Clearing Machine Corp.—Roy Prochnow, factory manager since 1951, was recently appointed assistant to the director of operations.

Illinois Gear & Machine Co.—T. S. Pacer has been elected executive vice-president. He was formerly vice-president of the company.

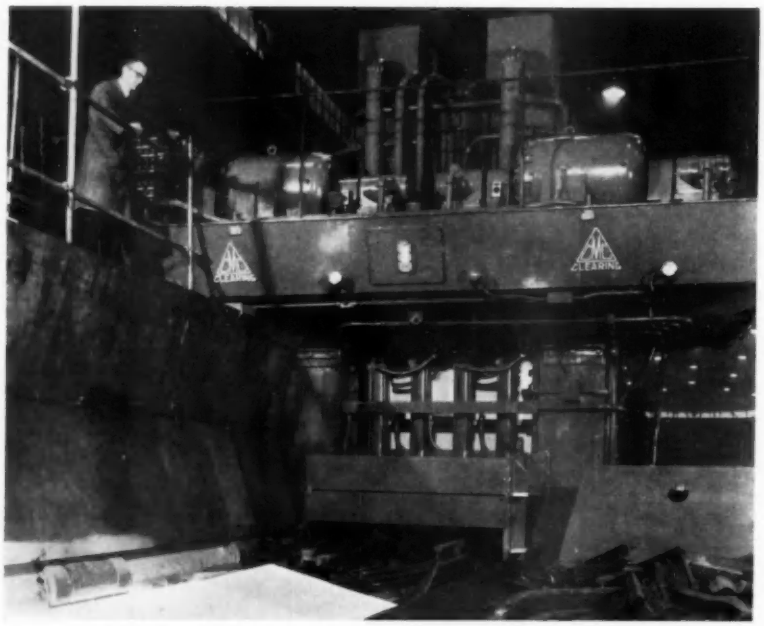
Dixie Tool Co.—new officers are: Ernest Swaine, president and general manager; Milo Shaner, vice-president and assistant general manager; Donald Alexander, treasurer; and Raymond Johnson, secretary.

Hughes Tool Co.—Leonard K. Schwartz has been named a vice-president. The exact area of his responsibilities was not announced,

(*Turn to page 94, please*)

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Clearing shearing press, capable of cutting up to 30 tons of scrap per hour

600 Ton Capacity Shear For Cutting Steel Scrap

A 600-TON capacity shear, weighing about 335,000 lb, was designed for cutting steel scrap into usable lengths. It is self-contained and hydraulically actuated. The motors, pumps, cylinders, valves, etc., located on the top of the crown are protected by a large weatherproof "house" to provide for full outdoor operation. After setup, only electrical connections need be made to begin operation.

A 22 ft hydraulically tilted hopper and a feed box with a hydraulic ram feed scrap into the blades at any predetermined length of push from 6 to 48 in., in 6 in. increments. The feed and shearing cycle are fully automatic and the shear will cut mild steel rounds to 5⅜ in. in diameter, or plate to 1¼ in. thick. The unit can cut up to 30 tons of scrap per hour, depending upon the type and size of material. *Clearing Machine Corp.*

Circle 22 on postcard for more data

Whiteprint Machine

THE modified Printmaster 810, a whiteprint machine for the reproduction of engineering and architectural drawings and a wide variety of business forms and other materials, accommodates materials of any length and up to 42 in. in width. Its printing and developing speeds are synchronized to 40 fpm.

Dimensions of the unit are 61 in. wide, 42 in. deep and 61 in. high. The front stacking tray will accept prints up to 24 in. long. An optional rear stacking tray handles prints up to 36 by 42 in.

Cylinder temperature of the machine is held to 50 to 60 degrees above room temperature. This permits plastic coated materials and foils to be processed without sticking in the printing sections of the machine. In addition, a filtered air system delivers air to the lamp cooling system and the developer print pickoff. This keeps blowers, lamps, cylinders and prints clean, and reduces machine shut-down time for cleaning. *Ozalid Div., General Aniline and Film Corp.*

Circle 23 on postcard for more data

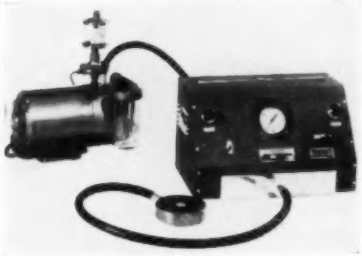
Layout Plates

LAYOUT plates, with machined T-slots in any arrangement specified, are available in sizes up to 10 by 20 in. in one piece or in sections. Designed to facilitate layout operations and to simplify fixture attachments, these plates feature an adjustability of 0.002 in. in any direction. All plates can be made with two inch clamping ledges on both sides and ends and plates can be furnished with machined grid lines. *Machine Products Corp.*

Circle 24 on postcard for more data

Flatness Tester

THIS tester was designed for determining degree of flatness or conformity for matching two pieces. Tests to reveal surface fissures, or to gage lapped and ground surfaces can also be made. Applications include the testing of individual parts and assemblies including face type shaft seals, metal seating valves of all types,



Gits Bros. low cost flatness tester

aircraft parts, magneto parts and "O" ring grooves.

The unit comprises a vacuum pump and instrument panel with an attached testing plate. In most cases, clamping fixtures are not needed since the vacuum pull acts as a sealing force. *Gits Bros. Mfg. Co.*

Circle 67 on postcard for more data

Honeycomb Inspection Kit

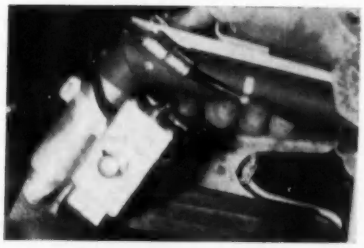
A METHOD for checking the bond in honeycomb structures, known as Bondcheck, was developed for use on metallic honeycomb, soldered, welded or brazed to the skin surfaces. The test procedure begins by cleaning the part and then spraying a specifically formulated red fluid that is repelled by heat and tends to flow to the coolest area on a metal surface. Next, a controlled heat is applied from a high-intensity infra-red lamp. This heat is conducted from the surface being inspected to the honeycomb core wherever good bond exists between the core and the surface. Since the visible fluid flows to the coolest areas, it accumulates at every good point of bond, reproducing an exact pattern of the bonded area. Areas of defective bond are visible as gaps in this pattern.

The powerstat, which enables the operator to vary the heat intensity, operates on 110 v, 60 cycle, 1 phase current, drawing up to approximately 15 amps. *Magnaflux Corp.*

Circle 68 on postcard for more data

Submerged Arc Welder

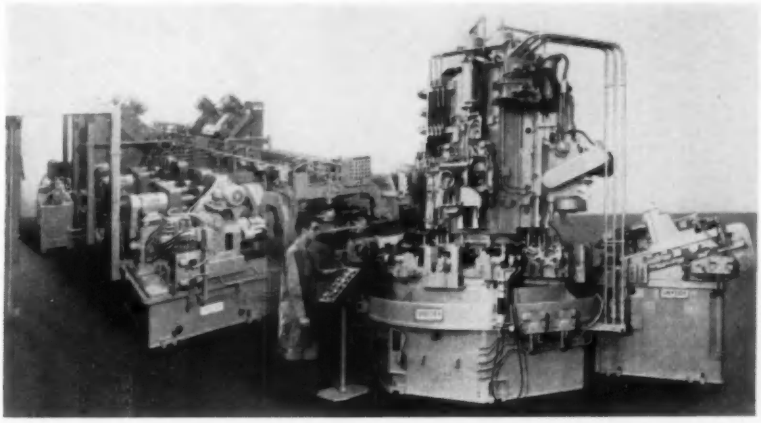
THE Lincolnweld ML-3, a submerged arc welding machine, designed for the submerged arc process, provides automatic wire feed, flux flow and travel speeds, and permits manual guiding of the welding arc. The unit feeds a continuous wire electrode from a coil to a hand-held gun which is held against the joint along which it is propelled at a preset speed by a small motor. A low pressure air system flows flux from a large tank to the gun. The flux then drops from the gun to cover the arc but does not flow ahead of the arc.



Lincoln ML-3 submerged arc welding unit

Speeds up to 70 ipm using up to 600 amps are possible with this unit. It can be used on materials ranging in thickness from 10 gage up. With the exception of the power source, the machine is self-contained and is readily portable. *The Lincoln Electric Co.*

Circle 69 on postcard for more data



Snyder axle housing line combines center-column and in-line transfer machines

Center Column, In-Line Transfer Machine Combination

AN automated machining line combines a center-column type machine tool producing in synchronism with an in-line transfer machine. Automotive axle housings are accurately machined on this unit at a net production rate of 75 per hour.

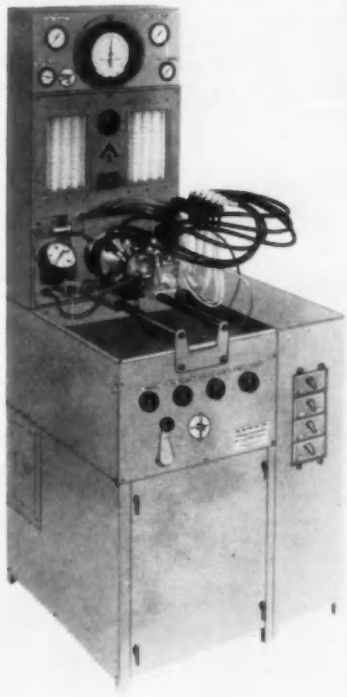
The 76 in. diameter, four-station center-column machine has equalizing clamping fixtures that centralize the housing banjo sections and assure that all portions of the part to be machined will clean up in subsequent operations. An arm-like, hydraulic-powered device at the unloading station of the center-column machine unloads the machined housings, rotates them 180 degrees to dump out the chips, and places them in proper location on the transfer mechanism of the 35½ ft long, 17-station, segmentated in-line machine. *Snyder Tool & Engineering Co.*

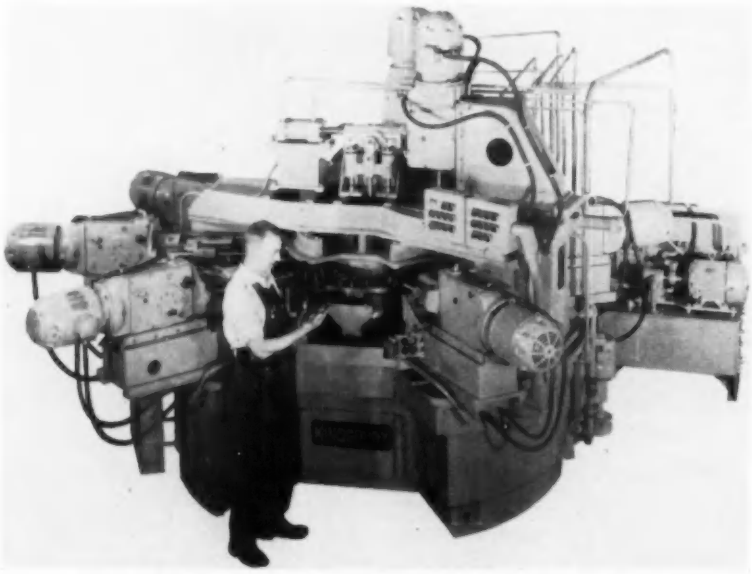
Circle 70 on postcard for more data

Fuel Injection Test Stand For Pumps And Nozzles

This fuel injection test stand designed for the complete testing of a line of fuel injection systems is equipped for pre-testing, calibrating and trouble shooting of pumps and injector nozzles. Known as Series 600G, Model S-2, it is a self-contained, electrically powered unit capable of driving pumps under simulated engine conditions at varying loads and rotative speeds. Each stand is equipped with fuel flow specification charts so that the output of each pump may be adjusted to match factory calibration standards. (Simmonds Aerocessories, Inc.)

Circle 71 on postcard for more data





Kingsbury indexing machine has a production rate of 200 parts per hour

Multi-Unit Automatic For Throttle Body Castings

THIS indexing machine performs critical operations on four throttle bores and two throttle shaft holes at a gross rate of 200 parts per hour.

Only two tools could be used to ream four bored holes so that each pair would be exactly the same size. After the two vertical units each ream one hole, the mounting columns move hydraulically and each tool reams its second hole.

The throttle shaft holes require five operations through three walls. Each wall must have a guide bushing for each operation. The bushings are in the stationary housing above the index table, along with locators and clamping plungers for every working station. The indexing table carries the parts to each station and also moves up and down.

After the operator changes parts in the fixture he presses two buttons to start the automatic cycle. A hydraulic cylinder on the bridge drops the index table, indexes it and raises it to clamp each part at the next station. The units then perform their cycles. The horizontal units drill the throttle shaft holes in two steps, rough and finish line ream and counterbore. *Kingsbury Machine Tool Corp.*

Circle 72 on postcard for more data

Parts Flat and Hollow Ground on New Machine

This hydraulic grinder is capable of grinding 1500 parts 8 in. long in eight hours. Equipped with an 8 by 47 in. table, a swivel head, automatic rapid traverse between stations, and a 3 hp, 1160 rpm motorized spindle, the unit can be used for volume production flat and hollow grinding of parts. The machine can be furnished with a wet attachment. (Abrasive Machine Tool Co.)

Circle 73 on postcard for more data

Portable Welding Unit

A MANUAL unit for the application of the Aircomatic or inert-gas-shielded arc-welding process provides a new type of wire feeding system to handle the broadest range of wire types and sizes, from the finest to the heaviest.

Developed initially for welding aluminum, the process is now being used to cut and spot-weld all commercially weldable metals. Both push and pull guns are available to cover the complete range of wire types and sizes from 0.020 in. hard to ⅛ in. aluminum. The equipment is portable.

The Aircomatic process employs a consumable electrode in wire form. This spooled wire and the inert shielding are fed into a weld at a high speed. The gas envelops the weld area to prevent atmospheric contamination. *Air Reduction Co., Inc.*

Circle 74 on postcard for more data

Torque Converter

HEAVY bolts and wheel nuts up to 1¼ in. in diameter can be removed or installed with the "Little Giant" reversible air wrench featuring the Vari-Torque power converter. High-torque motor output is sustained

Chicago torque converter air wrench

by the flywheeling action of the striking hammer, providing extra effectiveness to every impact blow. Power losses created by compressing springs or overcoming the drag of centrifugal force are eliminated.

Impact action is controllable so that large and small nuts may be safely driven to proper tightness. A 6 in. extension shank provides the reach and clearance required on deep recessed rim designs. *Chicago Pneumatic Tool Co.*

Circle 75 on postcard for more data

Fast Acting Cam Clamp

OFFERING fast action for light duty clamping where you must move quickly in restricted space, a cam type clamp with interchangeable soft metal pads is available in sizes from ¼ to ⅝ in. The pads are attached to the strap with two screws enabling quick changes. Heat treating can be applied for durability on long work-

Jergens fast acting cam clamp

runs and brass or bronze pads can be used for extra soft work. An end slot for lateral adjustment is included. *Jergens Tool Specialty Co.*

Circle 76 on postcard for more data

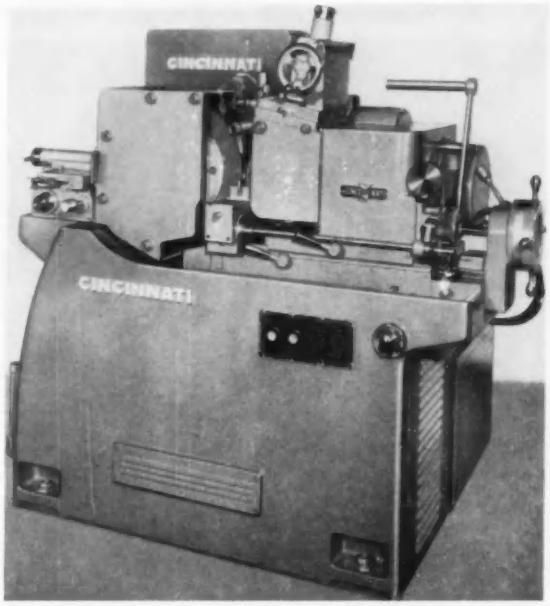
Reversible Tap Driver

THE "Safe-Torque" reversible tap driver permits high-speed tapping operations on machines which have no means of reversing the spindle. Principle of the design is such that high-quality threads can be tapped

Scully-Jones tap driver prevents tap breakage and increases tap life

in all types of work without danger of tap breakage, once the driver is adjusted to the correct torque setting. *Scully-Jones and Co.*

Circle 77 on postcard for more data



Cincinnati centerless grinder No. 1 has its controls contained in a cabinet with the exception of the regulating wheel drive motor; wiring conforms to JIC electrical standards. Attachments and accessories include infeed and thrufeed work rests and blades; two types of automatic infeed attachments; crush truing; profile truing; grinding wheel positioning and others.

Special Bearings Featured On Centerless Grinding Unit

NO. 1 centerless grinding machine, with a 7½ hp rating for the grinding wheel spindle, has a capacity for 0 to 1½ in. diameter work.

Features include Filmatic bearings for the grinding wheel spindle which consist of three segments and automatically adjust for load and eliminate spindle flutter. The spindle is supported in a fixed mounting in the bed casting. A double slide and swivel plate construction between the regulating wheel housing and bed simplifies setups. The regulating wheel and work rest can be positioned individually or together in relation to the grinding wheel, and, through the swivel plate, can be adjusted to compensate for the slight errors of alignment in setup or truing.

Ways for the regulating wheel pile are lubricated from a central reservoir with a manual pump.

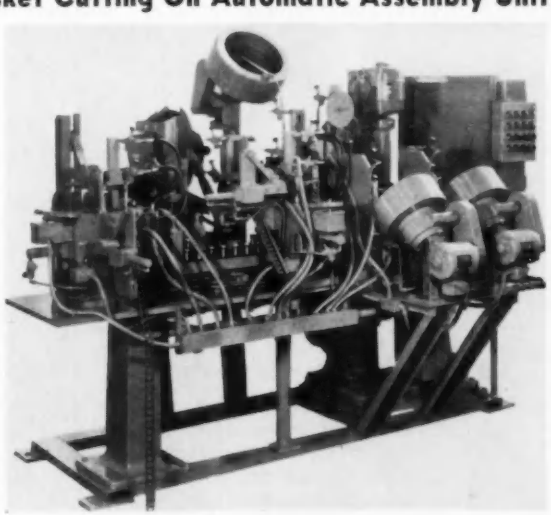
Regulating wheel speeds are infinitely variable. A wide V-belt running between two pairs of sheaves provides the method for changing speeds. An individual ½ hp motor supplies the power, and a built-in tachometer indicates the spindle speed. *Cincinnati Grinders Inc.*

Circle 78 on postcard for more data

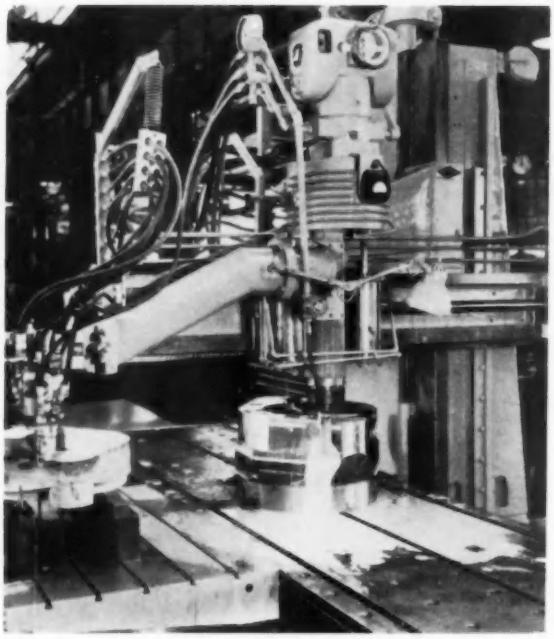
Diaphragm, Gasket Cutting On Automatic Assembly Unit

Diaphragm and gasket cutting from reel stock is a feature of this automatic, in-line, small component assembly machine. Shown, the unit is being used for assembling carburetor diaphragm valves. The stem, body and outer retaining washer are hopper-fed and assembled automatically. The two diaphragms are cut from neoprene fabric stock; center hole punched, blanked, and transferred to the part. Gaskets are fed, cut and assembled similarly at another station. (Gray Equipment Mfg. Co.)

Circle 79 on postcard for more data



Constant HP Hydraulic Milling Spindle



Shown mounted on a converted three-dimensional tracer-controlled milling machine is a hydraulic milling spindle. This 25 hp. variable-speed spindle provides constant hp at speeds from 60 to 3000 rpm. Two hydraulic cylinders control the 8 in. vertical travel of the milling head. The head can be swiveled 45 degrees each side of vertical. Feed rates range from 0 to 25 ipm. Power, for both machine movements and spindle rotation, is from a 30 hp hydraulic power unit using a 20 gpm variable-delivery pump to the spindle and a dual pump of 11 gpm capacity for table rapid traverse and three directional feed movements. (Romulus Tool and Engineering Co.

Circle 80 on postcard for more data

Ellis vertically opposed production machine. Maximum spindle stroke of each unit is three in. while the largest opening possible between chucks at rest position is 22 in. Both units and table are adjustable vertically on a solid steel column through a gear and pinion to a common rack. Nominal spindle alignment from tool to tool is guaranteed within 0.003 although dead center alignment is possible by adjustments. The machines are available with all technical controls built in including a JIC electric panel with push buttons and safety retract switch. Weight is about 800 lb.

Vertically Opposed Automatic Production Machine

DEBURRING, chamfering, spot facing, drilling, tapping and other related machining operations are possible individually, simultaneously or in seqquence with this vertically opposed production machine. It can be used with a small index table, manual or air clamp fixtures, hopper or vibration feed.

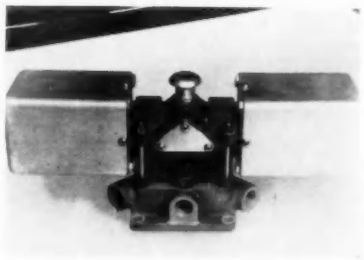
The unit is furnished with two Dunmore series 24 automatic drill units that have a drilling capacity of ⅜ in. and a tapping capacity of ½-13 in mild steel at 10 speeds from 400 to 7420 rpm by interchanging pulley combinations. Controlled feed range is up to 60 ipm, while the rapid approach rate is 600 and the return rate is 300 ipm. *R. E. Ellis Engineering Co.*

Circle 81 on postcard for more data

Plug-In Solenoid Valve

AN electrically actuated pneumatic valve has been designed with quick disconnect features for easy servicing and instantaneous replacement in automatic machines. The valve conforms to JIC standards and provides an efficient control device for automation set-ups using shop air.

Named the Model P/N 220155, the valve is a four-way, three-position so-



Whittaker 4-way, three-position valve

lenoid ac actuated unit rated at 100 psi service pressure and operated by 115 v, 60 cycles ac. Port sizes are ½ in. NPTF dry seal throughout.

Made of die cast aluminum, the device was designed for mass-production and automated assembly line equipment. It is slight in weight, is corrosion resistant and requires no lubrication. The valve can withstand surge pressures of at least 250 psi. *Whittaker Controls, Div. of Telecomputing Corp.*

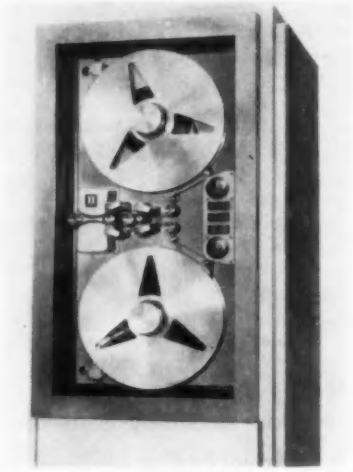
Circle 82 on postcard for more data

Self-Setting Clamp

THE Autoset self-setting clamp line includes the type DO, especially designed for small work and close quarters. Having a clamping range of 1/64 to ⅞ in., the clamp measures 2 5/16 in. long by 1½ in. wide. It needs no packing or shims. They are made of malleable castings and the rocker washer is fastened to the clamp body. *Alpha Tool & Supply Co.*

Circle 83 on postcard for more data

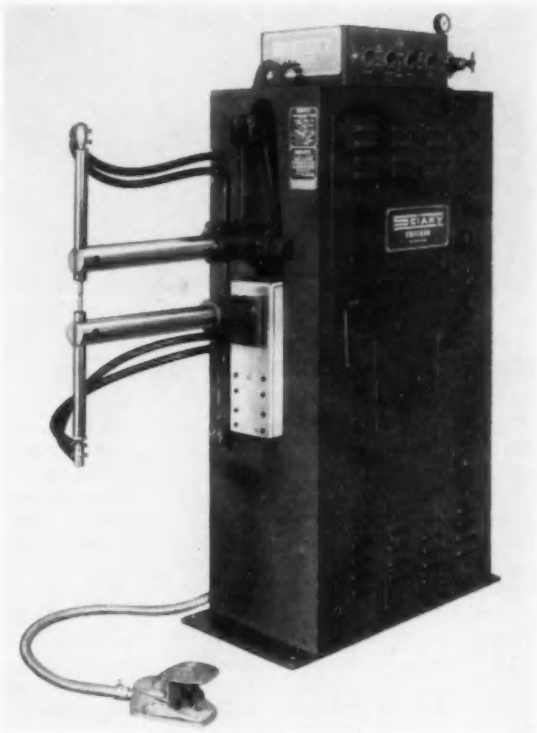
Telemetry Tape Transport



This tape transport has been designed for telemetry and other analog data applications. It permits separate recording, or in combination with direct-reading frequency modulation or pulse-width modulation. It can handle up to 14 in. reels and has 6 tape speeds. (Minneapolis-Honeywell Regulator Co.)

Circle 84 on postcard for more data

Single Phase Rocker Arm Spot Welder



This single phase SR O rocker arm spot welder was designed for the rugged shop conditions found in the metal working industry. The frame is unusually rigid; the control is transistorized with plastic-coated printed circuitry and plug-in components. The units have application in relatively light gage metal fabricating. They are available in standard O size frame, with 30 or 50 KVA transformer. Throat depth can be varied by a choice of six arm lengths ranging from 12 to 42 in. (Sciaky Bros., Inc.)

Circle 86 on postcard for more data

Engine Analyzer

ALL internal combustion engine pressures, vibrations and ignition voltages can be measured directly by the SLM engine indicator-analyzer, Series EA-114. Utilizing the electrostatic principle, the unit is used to make precision dynamic measurements.

The heart of the system is a Swiss made quartz crystal pressure gage which presents a visual display of vital engine functions on a standard oscilloscope screen. Cylinder, manifold, fuel injection and detonation

Kistler engine indicator-analyzer

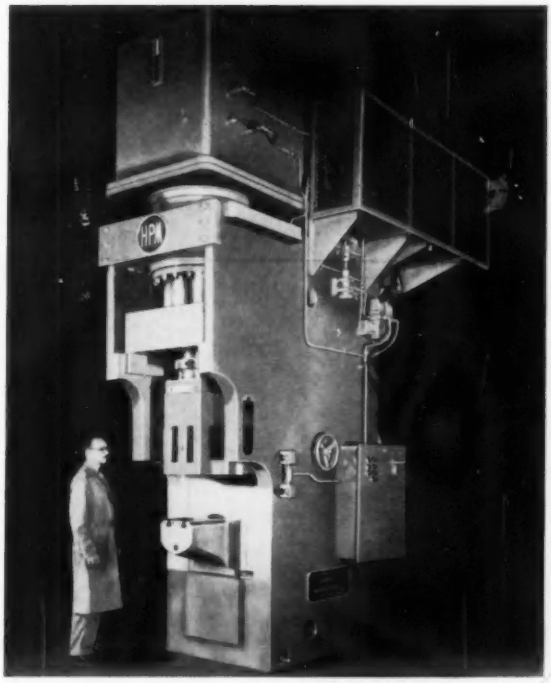
pressures, combustion pressure rates, engine vibrations and crankshaft torsional vibration can be alternately shown and measured. *Kistler Instrument Corp.*

Circle 85 on postcard for more data

500-Ton Open Gap Horn Press

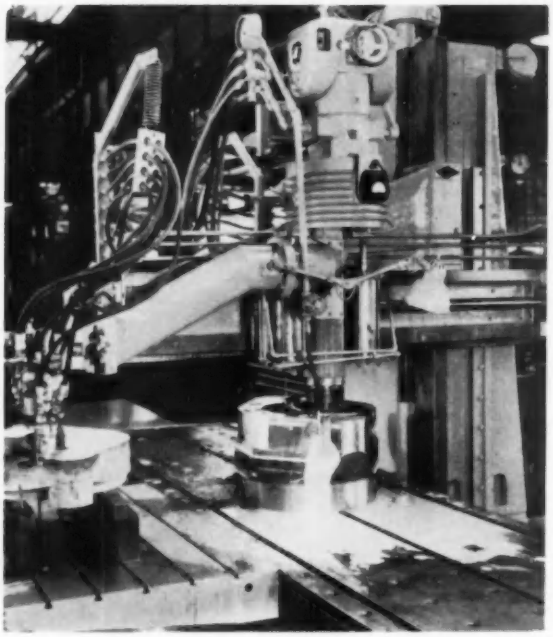
This 500-ton open gap horn press has an eight in. throat depth, 19½ in. daylight, 6 in. stroke and a moving slide area of 14 by 14 in. The frame is of welded steel construction, fully stressed relieved prior to machining. The unit is equipped with the closed circuit Fastraverse system of operation with manual and automatic press control. The circuit has one 50 gpm radial piston pump, piston type safety valves to prevent overloading the press and pump on both forward and return strokes and one 50 hp electric motor. The press is about 16 ft high and needs a 36 by 90 in. floor space level and a 72 by 121 in. space at the power unit. Weight is 76,800 lb. (The Hydraulic Press Mfg. Co.)

Circle 87 on postcard for more data



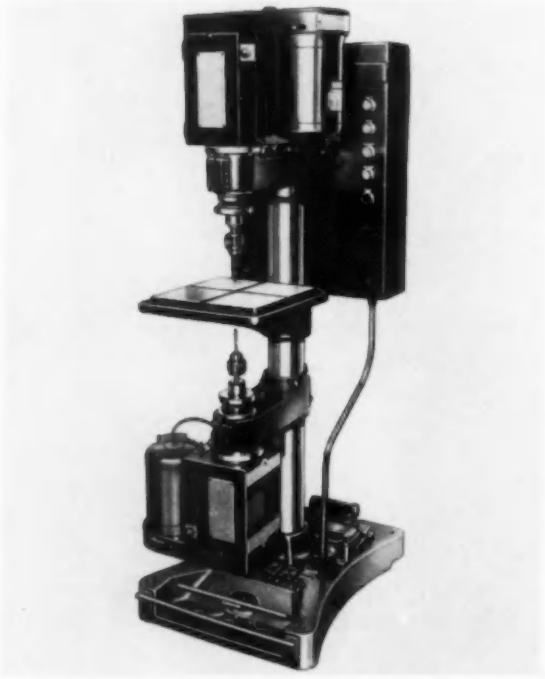
Reader-

Constant HP Hydraulic Milling Spindle



Shown mounted on a converted three-dimensional tracer-controlled milling machine is a hydraulic milling spindle. This 25 hp. variable-speed spindle provides constant hp at speeds from 60 to 3000 rpm. Two hydraulic cylinders control the 8 in. vertical travel of the milling head. The head can be swiveled 45 degrees each side of vertical. Feed rates range from 0 to 25 ipm. Power, for both machine movements and spindle rotation, is from a 30 hp hydraulic power unit using a 20 gpm variable-delivery pump to the spindle and a dual pump of 11 gpm capacity for table rapid traverse and three directional feed movements. (Romulus Tool and Engineering Co.

Circle 80 on postcard for more data



Ellis vertically opposed production machine. Maximum spindle stroke of each unit is three in. while the largest opening possible between chucks at rest position is 22 in. Both units and table are adjustable vertically on a solid steel column through a gear and pinion to a common rack. Nominal spindle alignment from tool to tool is guaranteed within 0.003 although dead center alignment is possible by adjustments. The machines are available with all technical controls built in including a JIC electric panel with push buttons and safety retract switch. Weight is about 800 lb.

Vertically Opposed Automatic Production Machine

DEBURRING, chamfering, spot facing, drilling, tapping and other related machining operations are possible individually, simultaneously or in seqquence with this vertically opposed production machine. It can be used with a small index table, manual or air clamp fixtures, hopper or vibration feed.

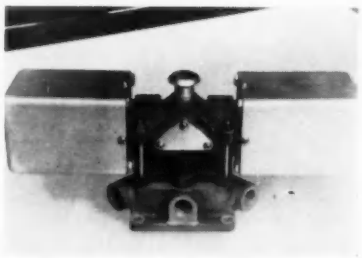
The unit is furnished with two Dunmore series 24 automatic drill units that have a drilling capacity of ⅜ in. and a tapping capacity of ½-13 in mild steel at 10 speeds from 400 to 7420 rpm by interchanging pulley combinations. Controlled feed range is up to 60 ipm, while the rapid approach rate is 600 and the return rate is 300 ipm. *R. E. Ellis Engineering Co.*

Circle 81 on postcard for more data

Plug-In Solenoid Valve

AN electrically actuated pneumatic valve has been designed with quick disconnect features for easy servicing and instantaneous replacement in automatic machines. The valve conforms to JIC standards and provides an efficient control device for automation set-ups using shop air.

Named the Model P/N 220155, the valve is a four-way, three-position so-



Whittaker 4-way, three-position valve

lenoid ac actuated unit rated at 100 psi service pressure and operated by 115 v, 60 cycles ac. Port sizes are ½ in. NPTF dry seal throughout.

Made of die cast aluminum, the device was designed for mass-production and automated assembly line equipment. It is slight in weight, is corrosion resistant and requires no lubrication. The valve can withstand surge pressures of at least 250 psi. *Whittaker Controls, Div. of Telecomputing Corp.*

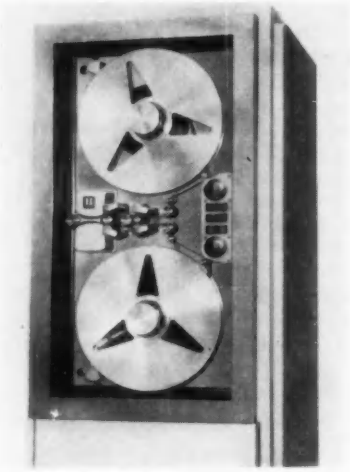
Circle 82 on postcard for more data

Self-Setting Clamp

THE Autoset self-setting clamp line includes the type DO, especially designed for small work and close quarters. Having a clamping range of 1/64 to ⅞ in., the clamp measures 2 5/16 in. long by 1½ in. wide. It needs no packing or shims. They are made of malleable castings and the rocker washer is fastened to the clamp body. *Alpha Tool & Supply Co.*

Circle 83 on postcard for more data

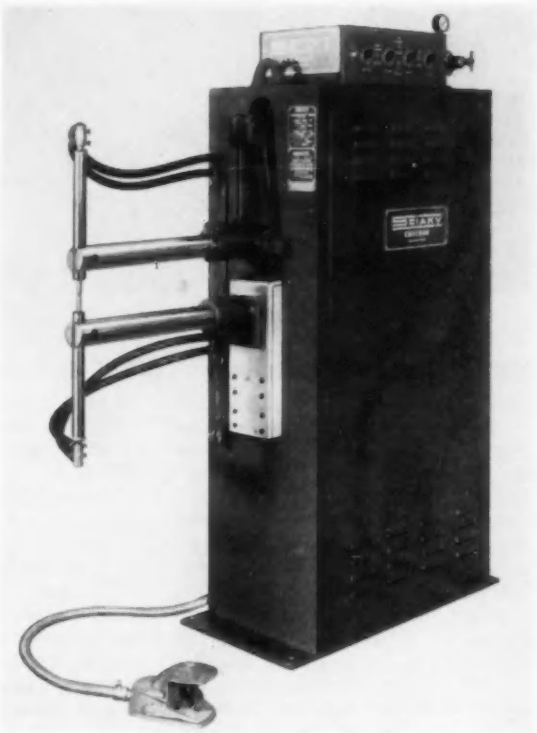
Telemetry Tape Transport



This tape transport has been designed for telemetry and other analog data applications. It permits separate recording, or in combination with direct-reading frequency modulation or pulse-width modulation. It can handle up to 14 in. reels and has 6 tape speeds. (Minneapolis-Honeywell Regulator Co.)

Circle 84 on postcard for more data

Single Phase Rocker Arm Spot Welder



This single phase SR O rocker arm spot welder was designed for the rugged shop conditions found in the metal working industry. The frame is unusually rigid; the control is transistorized with plastic-coated printed circuitry and plug-in components. The units have application in relatively light gage metal fabricating. They are available in standard O size frame, with 30 or 50 KVA transformer. Throat depth can be varied by a choice of six arm lengths ranging from 12 to 42 in. (Sciaky Bros., Inc.)

Circle 86 on postcard for more data

Engine Analyzer

ALL internal combustion engine pressures, vibrations and ignition voltages can be measured directly by the SLM engine indicator-analyzer, Series EA-114. Utilizing the electrostatic principle, the unit is used to make precision dynamic measurements.

The heart of the system is a Swiss made quartz crystal pressure gage which presents a visual display of vital engine functions on a standard oscilloscope screen. Cylinder, manifold, fuel injection and detonation

Kistler engine indicator-analyzer

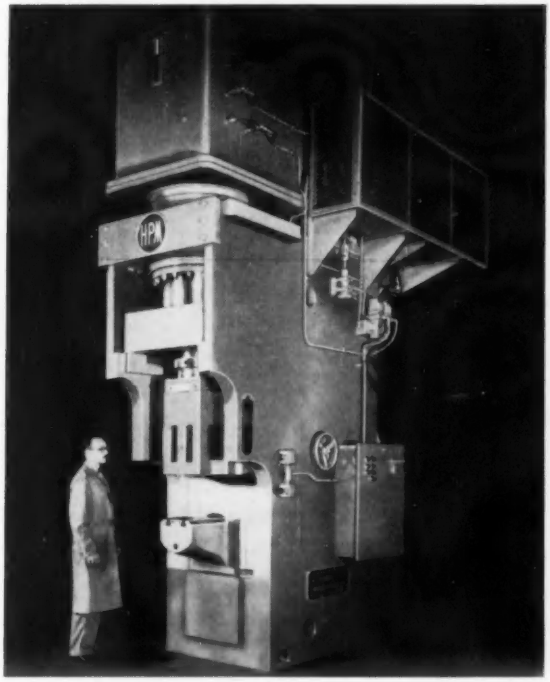
pressures, combustion pressure rates, engine vibrations and crankshaft torsional vibration can be alternately shown and measured. *Kistler Instrument Corp.*

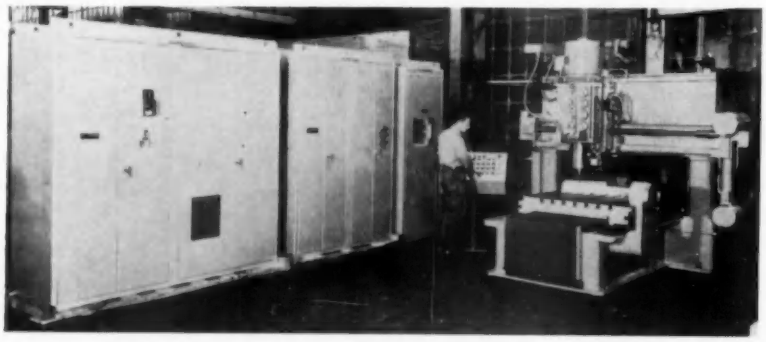
Circle 85 on postcard for more data

500-Ton Open Gap Horn Press

This 500-ton open gap horn press has an eight in. throat depth, 19½ in. daylight, 6 in. stroke and a moving slide area of 14 by 14 in. The frame is of welded steel construction, fully stressed relieved prior to machining. The unit is equipped with the closed circuit Fastraverse system of operation with manual and automatic press control. The circuit has one 50 gpm radial piston pump, piston type safety valves to prevent overloading the press and pump on both forward and return strokes and one 50 hp electric motor. The press is about 16 ft high and needs a 36 by 90 in. floor space level and a 72 by 121 in. space at the power unit. Weight is 76,800 lb. (The Hydraulic Press Mfg. Co.)

Circle 87 on postcard for more data





Morey Model A50 profile, contour milling machine with numerical control

Numerically Controlled Profile, Contour Milling Machine

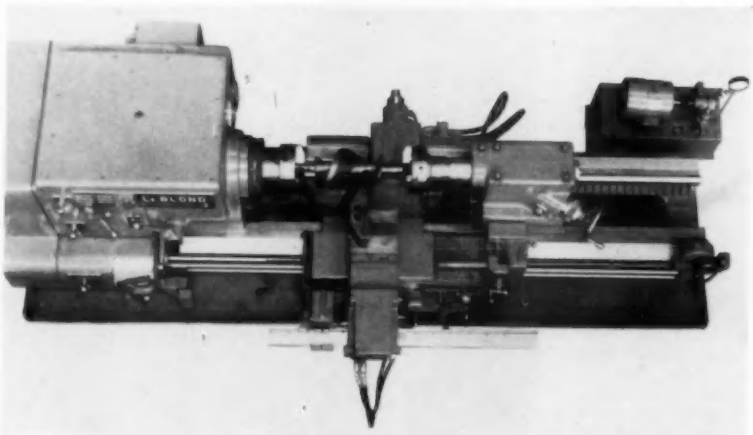
THIS numerically controlled profile and contour milling machine was developed for automatic small-quantity production. Its three-motion magnetic tape control system, designed by General Electric Co., directs vertical, transverse and longitudinal milling at rates up to 100 ipm and at tolerances to ± 0.001 in.

Rigidity of the machine is demonstrated by the fact that a finish of 40-50 RMS is obtained on a roughing cut. The unit is provided with speeds and feeds to machine any material from tough-alloy steel to non-ferrous metals.

The geared head is driven by a 30 hp motor and delivers speeds from 20 to 3600 rpm. The machine is equipped with micro-dials for positioning, push buttons which enable the operator to use the machine as a conventional milling machine, and magnetic tape controls for automation.

Since feed motion of all three axes is numerically controlled from magnetic tape, the cutter can be positioned or directed along a continuous path for various types of contouring operations and parts may have regular or irregular shapes, straight lines, angles or circles. Both machine and control require approximately 122 sq ft of floor space. *Morey Machinery Co., Inc.*

Circle 88 on postcard for more data



LeBlond contour chasing lathe machines concave and convex contours

Contour Chasing Lathe Machines Spiral Parts

A SPECIALLY designed 32 in. standard duty engine lathe automatically machines concave and convex contours on spiral shaped parts.

The outstanding feature of the unit is the unique application of a tracer unit. Instead of continuously tracing, it is used to position the tool for each successive cut. Tool cutting motion is accomplished by "chasing" the spiral, the same as chasing threads.

The carriage is synchronized with the spindle by an engagement of leadscrew and an extra-long full nut. In and out tool motion is provided by the cross slide. A tracer unit and template and a special slide mounted on the cross slide position the tool between cuts. Each feeding of the length slide moves the tracer stylus along the curved template, which positions the tool for the next cut. A special work driver and locating pin keep the workpiece from slipping while under cut, thus preventing any change due to the relationship of tool and workpiece. *The R. K. LeBlond Machine Tool Co.*

Circle 101 on postcard for more data

Nickel Refining Process

A MAIN feature of a process for the electrorefining of nickel is the direct electrolysis of nickel matte, an artificial sulphide. The process eliminates high-temperature oxidation and reduction operations, with attendant losses of metals, sulphur and selenium. Instead, nickel sulphide of low copper content from the Bessemer converter or other source can be cast directly into sulphide anodes and electrolyzed for the production of high quality nickel. Another feature is the commercial recovery of elemental sulphur and selenium as by-products, in addition to cobalt and precious metals conventionally recovered. Sulphur-selenium separation is accomplished in a 100 ft high fractionating column of special design. *The International Nickel Co., Inc.*

Circle 102 on postcard for more data

Press Overload Device

HIGH speed presses and dies are protected against misfeed or doubling of material by the Precision Flextop, a safety overload device. Its design is based on the well-known phenomenon in presses that the crankshaft deflects slightly with each stroke. This in turn deflects the flywheel. If two thicknesses of stock enter the die as a result of a misfeed, this deflection is greater than normal. The device detects the added deflection on stock 0.010 in. thick and heavier and stops the machine. It will not permit more than two thicknesses of stock to enter the die at the same time. The device is easily wired into the emergency stop circuit on any press with an air clutch. *Precision Welder & Flexopress Corp.*

Circle 103 on postcard for more data

Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Automatic Conveyors 1

Bulletin FAC-103, four pages, features many photographs of actual in-plant adaptations of a line of electroplating and anodizing conveyors made by *Hanson-Van Winkle-Munning Co.*

Expanding Mandrels 2

A four page brochure covers a line of expanding mandrels. A description of each type of mandrel, straight jaw, step jaw and miniature along with the range of available sizes is included. *Le Count Tool Works, Inc.*

Mountings 3

A complete line of standard mountings, including bearings, caps, carriers, seals, etc., for double-enveloping worm gear sets is described in 20 page Bulletin 750-C. *Cone-Drive Gears, Div. Michigan Tool Co.*

Platinum-Clad Metals 4

General Plate Div. of Metals & Controls Corp. has published a bulletin on platinum-clad metals, PLA-5. A description and various applications are included.

Finishing Equipment 5

Bulletin 600 describes a line of finishing equipment. Featured in this bulletin is the inclusion of isometric drawings of different types of finishing equipment. *Schmieg Industries, Inc.*

Universal Grinder 6

A 24 page catalog describes the Landis 10 in. Type H universal grinder. Complete specifications plus standard and extra equipment are included. Catalog 1-57. *Landis Tool Co.*

Control System 7

Complete information about a current-adjusting type control system for use with magnetic amplifiers and saturable core reactors is available in a series of data sheets from *Leeds & Northrup Co.*

Pushbutton Switches 8

Data Sheet 143, eight pages, describes a modular mount series of Micro Switch lighted pushbuttons. Complete information, photos of applications and dimension drawings of the series, along with colors and types included. Electrical characteristics and prices are also covered. *Micro Switch, Div. of Minneapolis-Honeywell Co.*

Resistance Welding 9

Bulletin 341 explains how resistance welding techniques are adapted to meet unusual fabricating requirements on a wide range of products. Applications described include multiple gun spot welding, multiple gun projection welding, mash welding and seam welding with either standard or special welders. *Sciaky Bros., Inc.*

(Please turn page)

VOID After June 1, 1958 **4/1/58**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120

NAME ..... TITLE .....
(Please Print)

COMPANY OR BUSINESS .....

ADDRESS ..... (No. & STREET) ..... (CITY) ..... (ZONE) ..... (STATE) .....

FIRST CLASS
Permit No. 36
New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES
P. O. Box 66,
Village Station,
New York 14, N. Y.

Readers Service Dept.

Production Finishing 10

The Mechamatic Finishing Process, a process developed to grind, deburr, descale, polish, burnish and color parts such as gears, body castings, and pressure plates is described in a 10-page catalog. *Mecha-Finish Corp.*

Cutting Tool Catalog 11

Catalog 23, 40 pages, covers a line of high speed and carbide cutting tools and lists prices along with specifications and applications for each fast-finishing, chatter-free tool. *Severance Tool Industries, Inc.*

Magnesium Booklet 12

An 11 page booklet prepared as a reference on the properties and characteristics of magnesium has been published by the *Dow Chemical Co.*

Miniature Bearings 13

A 24 page bulletin describing miniature ball bearings used in the instrumentation, aviation, guided missiles and other industries which use rotating or oscillating miniature components is available from *Miniature Precision Bearings, Inc.*

Bobbin Cores 14

Bulletin TB-103, four pages, covers a line of consistently uniform high quality bobbin cores for use in digital data processing systems. *G-L Electronics*

Cold Roll Forming 15

"Cold Roll Forming" is the title of an 88-page reference manual that tells how to produce a wide variety of metal shapes by this method. It includes a complete discussion of the mechanics and possible applications of the cold roll forming process to various sized operations. *The Yoder Co.*

Compression Systems 16

Six page bulletin 100 describes models of pre-engineered central compression systems for supplying air or gases at 3500 to 12,000 psi at point of use for industrial processing, design and testing uses. *Cardox Corp.*

Filter Equipment 17

Illustrated catalogs describing and listing a complete line of filter equipment have been published by the *Fram Corp.*

Finishing Machine 18

Gisholt Masterline Superfinishers are pictured and discussed in a 44-page booklet. Superfinish is a method of producing a controlled surface finish ranging from less than one micro-in. RMS to 60 micro-in. RMS. *Gisholt Machine Co.*

Coil Stock Catalog 19

A condensed catalog presents the various features of many types of equipment for handling, reeling, stranghtening and feeding coil stock and for the winding of scrap. *F. J. Littell Machine Co.*

Stabilized Ceramics 20

Technical bulletin 686 NP 1, seven pages, describes the physical properties of three ceramics developed to meet the need for materials able to withstand temperatures too severe for metals. *Norton Co.*

Balancing Machines 21

Bulletin 56, nine pages, contains specifications, operating procedures and applications for Rava Electro-Dynamic balancing machines, suited for both mass production and small lot balancing. *Tinius Olsen Testing Machine Co.*

Aluminum

The subject of aluminum plate and sheet is covered in a 320 page book. The material includes a wide range of data on aluminum and its alloys. Address request on company letterhead to *Technical Editor, Kaiser Aluminum & Chemical Sales, Inc., 919 North Michigan Ave., Chicago 11, Ill.*

USE THIS POSTCARD

VOID After June 1, 1958 **4/1/58**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120

NAME ..... TITLE .....

(Please Print)

COMPANY OR BUSINESS .....

ADDRESS ..... (No. & STREET) ..... (CITY) ..... (ZONE) ..... (STATE) .....

FIRST CLASS
Permit No. 36
New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed In the United States

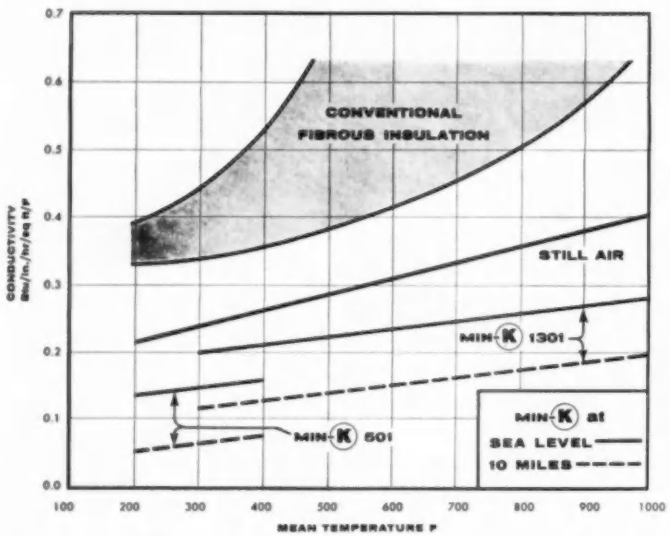
POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES
P. O. Box 66,
Village Station,
New York 14, N. Y.

Readers Service Dept.

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Thermal Insulating Material Has High Efficiency

Min-K, indicating minimum conductivity, is a thermal insulating material intended basically for guided missile and aircraft applications where space available for insulation is severely limited. It has a thermal conductivity below that of still air and less than one-half that of conventional fibrous insulation. Its performance is better at high altitudes than at sea level.

The content of Min-K has not been revealed, but it was stated to be made of inorganic materials and to contain some asbestos. It gets its insulating value primarily from the internal pore structure of the materials.

Min-K is a family of products ranging from the 500 series for lower temperature applications, to the 1300 series for use at temperatures as high as 1300 F. The thermal conductivity of two typical forms of Min-K is compared with that of conventional insulation materials and with the conductivity of still air in the accompanying chart. Min-K can be furnished in combination with a reinforced plastic laminate that protects the insulation from gas erosion and adds structural strength. It can be molded to shape, as well as enclosed in metal foil. *Johns-Manville Corp.*

Circle 89 on postcard for more data

Machinable Carbide

Carbide components requiring highly complex geometric form such as those requiring numerous holes, thin walls or drastic changes in cross section can be fabricated from a machinable carbide known as Ferro-Tic. Produced by powder metallurgy techniques, Ferro-Tic has a composite structure which can be annealed and quench hardened by conventional heat treating procedures.

Applications include drawing and forming dies, rolls, cutters and knives for non-metallics, guides, and bearing plates. Stock sizes including rounds up to three inches in diameter and rectangular bars up to six inches in length are offered. Special sizes and shapes are made to meet specific requirements. *Sintercast Corp. of America.*

Circle 90 on postcard for more data

Semi-Conductor Element

A semi-conductor element now being used for metal plating rectifiers is being made by the Equipment Div. of Wagner Brothers Inc. The nonmetallic element is silicon. Since it is permanent or ageless, it is said to eliminate the normal metal plating industry practice of replacing rectifiers every five years. The silicon elements enable plating rectifiers to operate at efficiencies equal to germanium at high voltage ratings. The units are capable of operating in surrounding temperatures of over 200 F.

Circle 91 on postcard for more data

Rate Integrating Gyro

A subminiature rate integrating gyro, designated SIR-1, designed for missiles and airborne armament control systems has a range of ±120 degrees per second. Other features include resolution of 0.002 degrees per second, linearity within 0.1 per cent of maximum value and mass unbalance of gimbal is 0.3 dyne-centimeter. The unit is 3 in. long and maximum diameter at the mounting ring is 1½ in. A full-floated gimbal assembly to insure resistance to the effects of shock and vibration, and to insure

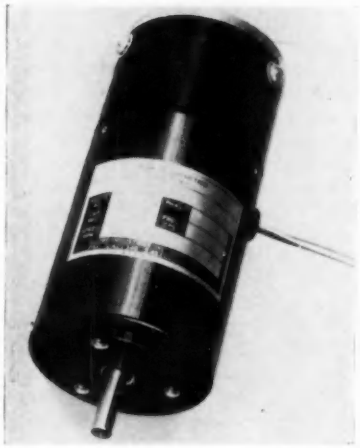
low friction at the gimbal bearings and a high-torque spin motor capable of reaching a synchronous speed of 12,000 rpm in four seconds are included. *Westinghouse Electric Corp.*

Circle 92 on postcard for more data

Miniature DC Brake

The Globe type FC motor can be furnished with an electromagnetic brake providing up to 10 oz-in. of holding torque when in the unenergized condition. The motor can be furnished as an hysteresis synchronous or induction type for 60 or 400 cps operation.

The combination of the brake and motor make it suited for actuator applications because of the high



torque rating of the motor and fast stopping and high holding torque provided by the brake. Overall length of the unit is 3¼ in. and weight is approximately 5¼ oz. *Globe Industries, Inc.*

Circle 93 on postcard for more data

Zinc-Coated Sheets

A line of electrolytic zinc-coated sheets, chemically treated for paint adherence, has application in the appliance, automotive and commercial equipment fields. The sheets are made in coils or cut lengths; in gages of 0.0079 to 0.040, and in widths of from over ½ to 28 in. inclusive. The width is dependent on the gage.

The electrolytic zinc coating is said to provide a uniform coating that prevents underfilm or rust or corrosion. The coating will not flake under drawing or forming operations. *Jones & Laughlin Steel Corp.*

Circle 94 on postcard for more data

Silicone Resin

A silicone resin designed for cold-blending with alkyd, melamine and acrylic type baking enamels is said to provide improved color and gloss retention, thermal stability and resistance to weathering. Named Union Carbide R-64 Silicone, this resin has application as protective coatings for aircraft engines and exhaust stacks and truck and automobile engine manifolds and mufflers. *Silicones Div., Union Carbide Corp.*

Circle 95 on postcard for more data

Power Transistors

Two germanium power transistors are electrically matched to provide low distortion in audio and servo applications requiring push-pull amplification. The units, designated 2N399 and 2N401, are rated at 8 w of undistorted Class B push - pull output power. Each unit can dissipate up to 25 w.

The 2N399 is a high-gain unit, and the 2N401 has a medium-gain power output. They feature welded construction with a hermetically sealed cover. Applications for the units range from installations in car radios to drive mechanisms for indicator dials. *Bendix Aviation Corp.*

Circle 96 on postcard for more data

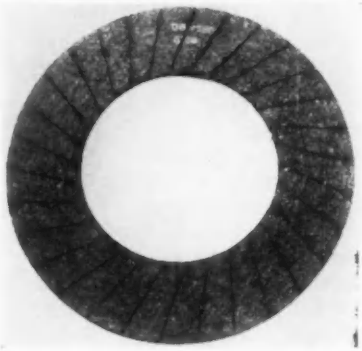
Thermal Time Delay Relay

Positive acting D series thermal time delay relay switches designed with an octal base for time delays from 5 to 90 seconds have application in industrial and commercial equipment. The dust tight unit incorporates single pole, single throw, normally open or normally closed contacts rated at 2 amp, 120 v ac or 1 amp, 32 v dc resistive loads. Ambient tempera-

ture is compensated for operation from 0 to 85 C. Standard heater voltage is 6.3, 26.5 or 117 nominal ac or dc. *Curtiss-Wright Corp.*

Circle 97 on postcard for more data

Clutch Facing Material



Due to its high centrifugal burst strength characteristics in dry applications this clutch facing material named Pyrotorq provides good durability and smooth engagement. It is made of non-woven asbestos felt to produce the desired friction range. (Raybestos-Manhattan, Inc.)

Circle 98 on postcard for more data

Retaining Ring

A line of retaining rings, available in many sizes up to two in. and in a variety of metals, conform to all required national standards. They are available in three types: the internal ring which has the lugs on the inside of the ring, the external ring which has the lugs on the outside of the ring and the standardized "E" ring for shoulders on small shafts. Various coatings are offered on the rings including cadmium plating, zinc plating, Parkerized coating, blue steel and black oxide. *Ramsey Corp., Sub. Thompson Products, Inc.*

Circle 99 on postcard for more data

Molding Compound

Durez 18683 is an impact phenolic molding compound designed for applications which require a long flow, good water resistance, and a glossy finish under low pressure molding conditions.

Parts molded from this material are dimensionally stable, have an impact strength of 1.4 ft-in., and give good results in high humidity tests. It is being used for applications such as textile pulleys, oil well plugs, gas meter housings, automotive heater housings, terminal connectors and electric motor end bells. It can be preformed automatically in horizontal preforming machines, and curing time is the same as for general purpose compounds. *Hooker Electrochemical Co.*

Circle 100 on postcard for more data

Friction Materials

(*Continued from page* 69)

cient strength. Also, unless the material is held securely in place by lugs, notches, gear teeth, or another type of spline, a floating disk results in only one-half the torque output of a splined facing or a riveted assembly having two working faces.

Whatever the circumstances, the friction material must be tight with the metal members to insure a good lining job. Bands and shoes should be properly rolled to the correct diameters, and all burrs which might prevent a close fit ought to be removed. Clutch plates must be flat and at right angles to the axis of rotation.

Bonding of friction materials to a metal member with synthetic resin or elastomer cement has grown in popularity in recent years for some applications. It is a process which requires careful preparation of the surfaces and must be done in strict accordance with the temperature, time, and pressure prescribed for the cement used.

The bonding method has met with particular favor in applications where space and weight are prime factors, as it allows the use of parts which would not have adequate thickness for proper riveting. There is considerable opinion that bonding creates a noise problem in brake linings, but proponents of the technique claim that it yields greater wear qualities and has an additional advantage over riveting in that rivet holes occasionally collect dust that tends to score the mating members.

Research and Development

If a single word were to be chosen to describe the character and the operations of the friction materials industry, the term "dynamic" would come immediately to mind. While comparatively small in numbers (about 30 major manufacturers in all), the friction materials industry does a multi-million dollar business annually in the original equipment, replacement, and export sales fields.

The progressive nature of the industry is perhaps best reflected in the extensive research and development facilities which its members maintain. Laboratories equipped with the latest scientific testing equipment, large fleets of test cars, and test areas with a wide range of terrain and weather conditions typify its forward-looking spirit. Each company also has an active force of field sales and service representatives to assist in providing customers with the best in engineered friction.

Never satisfied with its past significant achievements, the friction materials industry is constantly at work developing new and better materials for the vehicles of today and tomorrow. Composition brake linings are being steadily improved with new binders to provide increasingly uniform frictional stability and higher temperature resistance, while all-out efforts are being made to refine the metallic materials for expanded applications.

MACHINERY NEWS

(*Continued from page* 81)

but will undoubtedly have to do with the aviation activities of the company. He was previously, since 1940, associated with Lockheed Aircraft Corp.

Milford Rivet & Machine Co.—Fred H. Merwin, president since 1929, has become chairman of the board. Completion of the company's new laboratory and research facilities has also been announced. To be under the direction of Mr. Merwin, the new facilities will be devoted to new methods and product development, as well as the development and refinement of manufacturing equipment and techniques associated with the cold forming of metals.

The Monarch Machine Tool Co.—Net 1957 earnings of $1,010,018, equivalent to $2.42 per share, as compared to 1956 net earnings of $982,900 or $2.34 per share, are reported. Earnings increased despite a decrease of nearly six per cent in shipments, from $17,021,463 in 1956 to $16,041,903 in 1957.

• • •

Senator Monroney Bill Proposes Car Price Label on Windshield

Automobile factories will be handed a new chore if a bill just introduced in the Senate is enacted. The job: Placing a label on the windshield to suggest the retail price of each car.

Other information on the sticker would include name, make, model, serial number, freight charge, final assembly point, and the transporting method. The name of the dealer to whom the car goes also would appear.

All the information, says Sen. Monroney, D., Okla., is needed to tell the car buyer what he's getting. Offering the bill for himself and for Sen. Thurmond, D., S. C., he holds that the purchaser is told everything about the car except its actual price.

This price, according to Sen. Monroney, is the first thing the buyer needs to know. The customer doesn't get the information he needs "if the delivered retail price is hidden away," he says.

He contends that a requirement for factories to display a delivered list price by means of a label would be a step toward "competition" in new car pricing. It would, he thinks, restore public confidence in car merchandising and thus improve the market.

Except for disclosure of the suggested retail price, the new bill is similar to the Monroney antibootlegging proposal of 1956. Sen. Monroney plans hearings on the new measure (S. 3500) before his automobile marketing practices subcommittee and may start them during April.

• • •

North American Opens New Research Center

A new Rocketdyne Research Center is now in operation at the division's propulsion Field Laboratory in the Santa Susana Mountains, Calif.

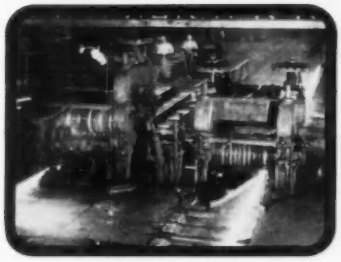
The division's Research Dept. is credited with the development of Hydyne, the hydrazine-base compound used to propel the Jupiter "C" and Explorer satellite into outer space.

ANOTHER COPPERWELD SERVICE

complete cold finishing facilities

Electric Furnace.

Ingot entering 35″ Blooming Mill.



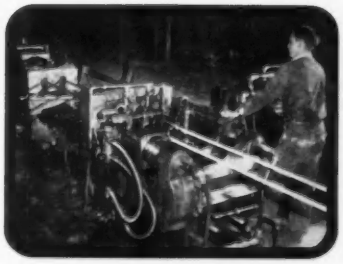
12″ Bar Mill in operation.

From electric furnaces to cold finishing—close metallurgical control is the secret of the uniform quality of Aristoloy blooms, billets and bars.

Starting with select raw materials, and exercising special care in melting and teeming operations, Copperweld produces the special Aristoloy ingot. From here, conditioning, rolling, thermal treatment, and cold drawing are under the same careful scrutiny . . . the same control. The result—steels of uniform quality bearing the name Aristoloy!

Cold finished Aristoloy as well as hot rolled products are available in standard A.I.S.I. analyses, including leaded—call your Copperweld Field Metallurgist for help in selecting the best grade for your job.

New Leaded Steel Catalog now available. Write for your copy today.



Cold Drawing.

ARISTOLOY STEELS

AMERICAN STEEL WAREHOUSE ASS'N

COPPERWELD STEEL COMPANY • Steel Division
4025 Mahoning Avenue • WARREN, OHIO

EXPORT: Copperweld Steel International Co.
225 Broadway, New York 7, N.Y.

Observations

By Joseph Geschelin

Motor Car Evolution

Paul C. Ackerman and H. R. Steding of Chrysler made an impressive analysis of the evolution of passenger cars over the years before The Senate Antitrust and Monopoly Subcommittee. They took an excellent example—the evolution of the Plymouth car during the past 20 years. Noting engine progress in terms of increased bhp/lb rating, and improvement of 15 per cent in specific fuel consumption, they showed that engine complexity has increased materially. For one thing there is an increase of 24 per cent in the number of parts and an increase of 26 per cent in total weight of the powerplant. Turning to a comparison between the old three-speed transmission and the present automatic drive, they showed that the number of parts in the synchromesh drive was 221 in the 1958 model compared with 671 for the two-speed automatic and 807 parts for the three-speed automatic drive. Moreover, the weight of the automatics is 192 and 225 lb respectively, compared with 81 lb for the latest manual shift unit. In our opinion, this comparison not only shows why the newer automatic devices cost more; it also indicates how much more process is involved and how many more man-hours are required to produce the parts and cars of today. It also explains why total employment in the automotive industries shows constant increases despite the greater utilization of automation devices and costly automatic machinery.

Optimism Needed

At a recent Buick luncheon meeting E. T. Ragsdale, Buick's general manager, made a plea for more optimism on the part of news media in general as well as on the part of everyone concerned with our economy. He noted, rightly too, that our enterprise system is particularly sensitive to psychological pressures. All we need to start a depression is to talk it up. Actually, despite serious unemployment, savings are at a high level. People have a lot of money on hand. But they are afraid to let go of it under present conditions. If people could be exposed to the positive side of our economy, its stability, its volatility, they could be impelled to invest in the future. What we need is buying, and Ragsdale feels that the bottom has been reached in car sales and the swing is upward even though it may not be clearly apparent.

Small Wheels

The brake session at the recent SAE National Meeting brought out some of the work being done by various companies in an effort to improve conventional brake systems. Most of the argument was devoted to experimental work with unconventional linings, including the use of segments of sintered or metal-filled molded linings. Attention also was drawn to fluid-cooled brake systems. Meanwhile, everyone concerned remained worried about the next move of the stylists. Will they try for 13-in. wheels next? That might be the last straw since the present brake systems appear to be right up to the limit of effectiveness.

Auto Mation

Thus far only a relatively small number of automatic assembly machines are in use. One of the important producers of transfer machines said recently that his company is engaged in the development of such equipment for a variety of applications. Any new principles that would aid in simplifying assembly machines and making them easy to tune will be welcome indeed.

Aluminum Engines

In discussing the matter of aluminum engines recently we learned of the possibility of a new metallurgical development. Apparently work is being done with an alloy that can eliminate the need for an iron cylinder liner. If this can be done it will mark a major break-through and simplify a hitherto troublesome design and manufacturing problem. A lot of cost can be taken out of an aluminum engine if sleeves can be eliminated, more if it is possible to eliminate valve seat inserts as well.

Small Cars

In recent months some of the big national magazines have published lengthy articles on small cars and have added to the hue and cry of some lawmakers demanding American-made cars to battle the menace of the European products. The writers have been well informed, in general, but show a lack of knowledge of manufacturing problems and costs. One of them takes the automobile producers to task for holding back on small cars. He feels that mass production experience should make it possible to build small cars at competitive costs regardless of the volume involved. Reporters outside Detroit apparently do not understand how much investment is involved in new equipment and tooling; and the role of numbers in the cost picture.

DU PONT

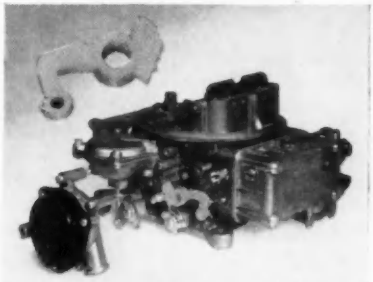
Better Things for Better Living ... through Chemistry

AUTOMOTIVE ENGINEERING NEWS

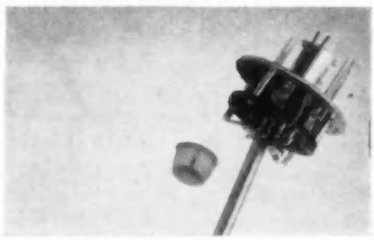
LATEST PROPERTY AND APPLICATION DATA ON ZYTEL® nylon resin

Fasteners made with a ZYTEL® nylon resin are self-locking ... vibration proof

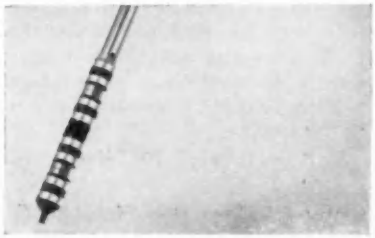
EDSEL uses ZYTEL® in carburetor and steering column

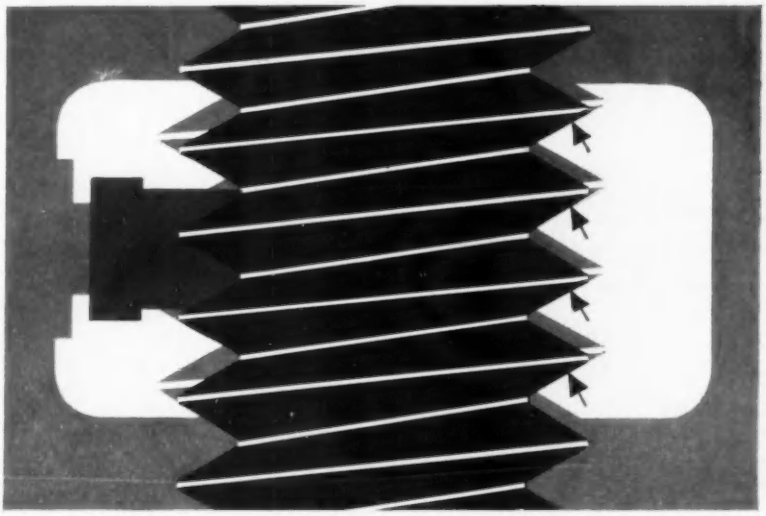


FAST IDLE CAM of the carburetors used on the new EDSEL is made of a ZYTEL nylon resin. Replacing metal, the molded cam eliminates 3 finishing operations and saves over 50% in production costs. The resin is unaffected by engine compartment heat. Strength and abrasion resistance of the part provides long operating life. (Part molded by Chicago Molded Products Corp., Chicago, Ill. for Holley Carburetor Co., Warren, Michigan.)



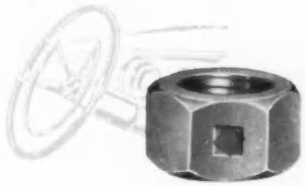
INSULATORS and switch parts at the top of the EDSEL steering shaft and collector rings at the bottom depend on good dielectric strength of ZYTEL resins. Tapered bushing used on shaft has excellent bearing properties and wear resistance. These EDSEL parts are supplied to Ainsworth Precision Castings Co., Division of Harsco Corp., Detroit, Michigan; by RBM Div., Essex Wire Corp., Logansport, Ind.; and Globe Imperial Corp., Rockford, Ill.





HOW IT WORKS: Small pellet of a ZYTEL nylon resin imbedded in fastener undergoes compression. The resilient pellet exerts a continuous, powerful lateral thrust, producing a strong metal-to-metal lock between opposite mating threads (see arrows). Two applications are shown below. (Made and licensed by the Nylok Corporation, Paramus, New Jersey.)

Fasteners made with an insert of a ZYTEL nylon resin produce a powerful locking action between threads of bolted assemblies. Due to the resilience and wear-resistance of the nylon insert, fasteners can be used over and over again. Positive, vibration-proof clamping action is obtained. This principle of Nylok fastening can be used to safely lock both nuts and bolts to displace lock washers throughout the car. The plug also prevents fluid flow along the spiral path of the threads. Since ZYTEL nylon resins are unaffected by oil or grease, no deterioration of the pellet occurs in contact with lubricated threads. Mail the coupon to obtain the facts on Du Pont ZYTEL nylon resins used as automotive design materials.



SEND FOR INFORMATION

For additional property and application data on Du Pont ZYTEL nylon resins, mail this coupon.

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept.
Room 4-3-15, Du Pont Building, Wilmington 98, Del.

Please send me more information on Du Pont ZYTEL nylon resin. I am interested in evaluating this material for

_____

*Name*_____

*Company*_____ *Position*_____

*Street*_____

*City*_____ *State*_____

*Type of Business*_____

IN CANADA: Du Pont Company of Canada (1966) Limited, P.O. Box 660, Montreal, Quebec

METALS

Bright Spot in the Steel Industry Is the Strong Demand for Tin Plate. Alloy and Stainless Production Is Lower

By William F. Boericke

First Quarter Disappointing for Steel

The steel industry operated at about 53-54 per cent of capacity in March. Based on 140.7 million tons capacity, this would indicate no more than 76 million tons for 1958 if projected at this rate for the year. Few would agree with so pessimistic a forecast. It would mean the worst year since 1946 when production was only 66.6 million tons. In the 1949 recession output was 77.9 million tons, and in the most recent slump, it fell to 88.3 million tons.

For 1958, steel men have scaled down their estimates from an earlier guess of 105-110 million tons to 95-100 million tons. Taking the lower figure of 95 million tons, this would indicate the industry must produce about 74 million tons over the next nine months, or operate about 71 per cent of capacity. As there is little reason to expect a sudden improvement in operating rate over the next few months, it appears that the second half of the year will see the upturn, and relying on the arithmetic above, it could be pretty fast.

Inventories Reduced

Most steel executives are thinking along this line. A U. S. official notes that there are several factors present today, which were absent in 1957, that promote optimism. Customers are not building inventories, but reducing them. The longer this goes on, the more certain it is that their normal buying for replenishment will require more steel. There has already been a mild improvement in order volume, although the average order is smaller. Undoubtedly the steel production rate today is geared to actual business booked, but consumption is higher than indicated by production because shipments are being made from inventories as well.

Tin Plate in Good Demand, Other Products Slow

It is generally agreed that the first quarter will prove in retrospect to have been the low for the year, with the industry's recession still rounding the bottom of a saucer-shaped bowl before starting to climb. Brightest spot in the steel industry is the strong demand for tin plate, which is expected to increase over 1957. The construction industry replaced the automobile in 1957 as steel's No. 1 customer, and judging from the Detroit outlook, it is likely to hold that place in 1958. But makers of structural shapes and plates are pounding the pavements for customers as their order backlog declines. Mills specializing in line pipe find conditions bad in the oil country, where there have been heavy cancellations of orders by the gas transmission companies, following uncertainty over rate increases because of an adverse decision in the Mitchell case. It is reported that more than a million tons of line pipe production is being held up. If the Supreme Court should rule that previous methods of setting rates were legal, a huge volume of orders would be reinstated. Unfortunately, it is indicated that the Court will not consider the case until fall. A sharp decline in new orders for freight cars has naturally followed the slump in rail earnings. Some satisfaction is gained from a slight increase in new orders for machine tools although the backlog of orders has fallen 50 per cent from January, 1957.

Alloys, Stainless Production Down

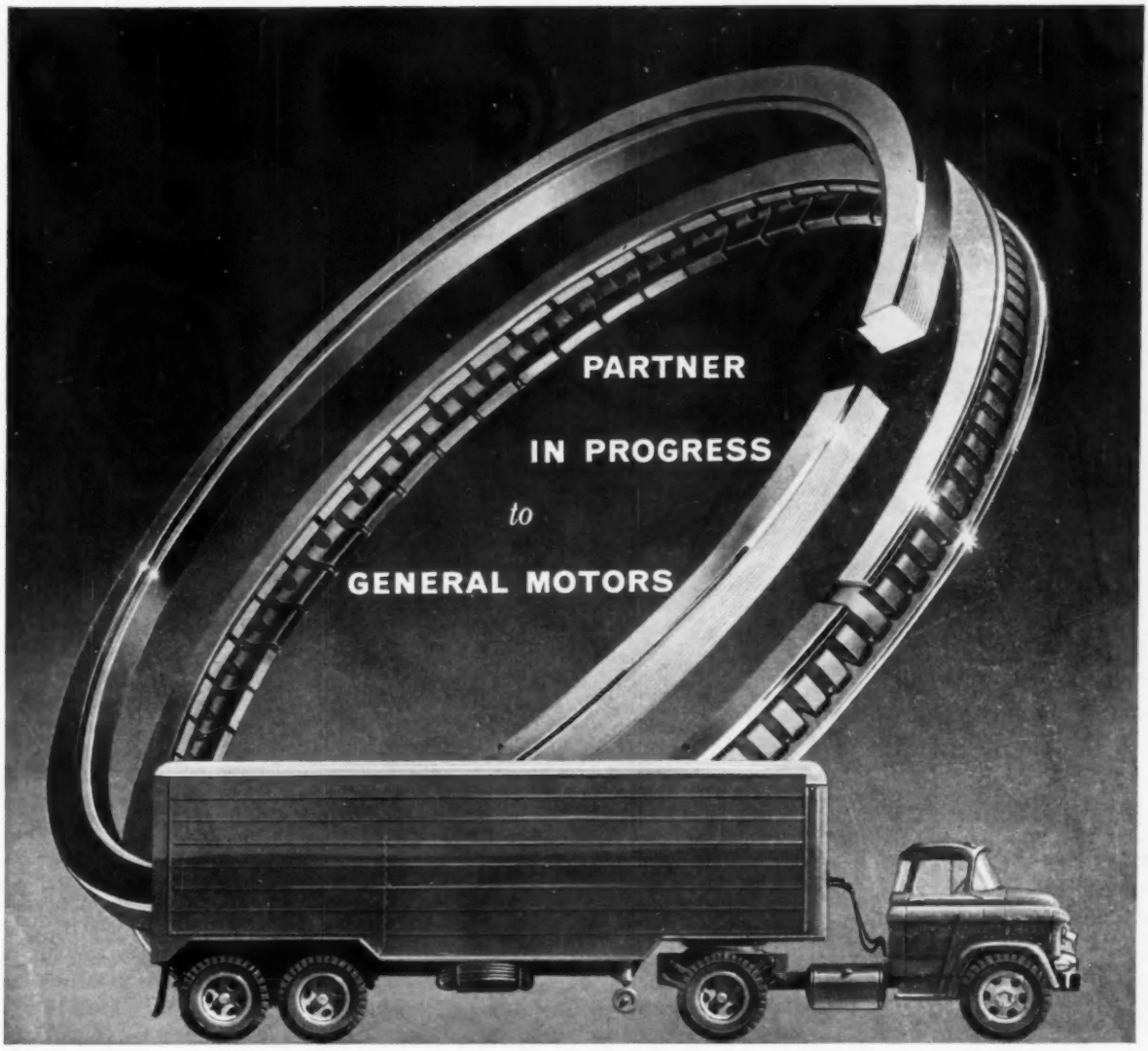
Alloy and stainless steel makers find business unremunerative. Production is about 60 per cent of the 1957 rate in the same quarter, and dropped to less than 600,000 tons a month. The average monthly rate in 1957 was 741,000 tons a month, and in 1956, over 860,000 tons. Consumption of iron has likewise declined about 33 per cent from the 1957 level. Ore stocks have climbed to 62 million tons against 49 million at the start of 1957.

Little Evidence Yet of Copper Curtailment

In spite of heroic efforts to curtail mine production both in U. S. and abroad, little effect is yet seen in the statistics for the industry. On a daily basis in February—because it is a short month, the monthly figures are misleading—mine output was actually higher than in January. Shipments of refined metal were lower and stocks of copper on hand with the producers and refiners climbed to 201,000 tons, highest for nine years.

Yet it can be only a matter of a few months before the drastic cutbacks in production will become plainly visible as the pipe lines of the industry become depleted. Since the first of the year production cuts have been announced in the U. S. alone that total 9700 tons a month, or more than 10 per cent below the average monthly output in 1957.

(*Turn to page* 100, *please*)



GMC TRUCKS...more ruggged, powerful and dependable than ever before...GMC is one of the leading engine manufacturers using Perfect Circle piston rings for both original equipment and replacement service.

Much history has been written since the early days when Perfect Circle began making parts to put horsepower into the "horseless carriage." Year after year, we have been privileged to take an active part in the development of the wonderful vehicle that is today's truck.

Because they are specifically engineered to meet the exacting demands of modern high-compression engines, Perfect Circle piston rings are preferred by more engine manufacturers for original equipment and for replacement service than any other brand.

When engine overhaul time comes, do as the manufacturers do! Specify Perfect Circles. PC 2-in-1 Chrome piston rings more than *double* the life of cylinders, pistons and rings, assure sustained power with lasting oil economy. Perfect Circle Corporation, Hagerstown, Indiana. The Perfect Circle Co., Ltd., 888 Don Mills Road, Don Mills, Ontario.

PERFECT CIRCLE PISTON RINGS

METALS

(*Continued from page* 98)

In addition, the production of two new major copper producers, totaling over 8800 tons a month, is delivered under contract to the stockpile and hence does not constitute copper available for sale on the market, at least at a 25 cent price. This would reduce the tonnage available to consumers from domestic sources to less than 76,000 tons a month.

London Price Improves, Domestic Price Holds

Consideration of this has undoubtedly been responsible in part for the rise in copper price on the London Metal Exchange as well as for the strength in copper futures on the New York Commodity Exchange. Advices from abroad indicate that the supply position of electrolytic copper in Europe, which has been tight for some time, is becoming more difficult. Substantial premiums have been paid on the Continent for wire bars and cathodes. In the U. S. market, General Cable Co. officials have noted that certain power utilities and other customers had switched back to copper wiring and cables where previously they had used aluminum. Russia is reported to be bargaining for a heavy tonnage of copper wire from European and British suppliers.

Some constructive action has occurred price-wise, although the producers' 25 cent price must be still considered vulnerable, and will remain so while the London price remains at 21 cents. But the fact that it held unchanged for over two months, in the face of depressing industrial news, is heartening.

A Four-Cent Tariff Possible

Some trade commentators emphasize the likelihood of a four-cent tariff being placed on copper imports in July. As it now stands, a 1.7 cent a pound tariff is automatically imposed after June 30. Such a tariff increase will be bitterly opposed by producers and users importing substantial amounts of their requirements from abroad, and just as fervently supported by those deriving their copper from domestic sources. Apparently the chances favor a higher tariff, and emphatically so if the present price declines further.

Zinc Output Cut, But Sales Decline As Well

February production of slab zinc was 14,000 tons less than January, or about 215 tons lower on a daily basis, reflecting the numerous cutbacks effected by the producers for several months past. On the other hand, domestic deliveries declined to 49,000 tons from 58,200 tons the month before. In consequence, stocks on hand at the end of February rose to the highest since August, 1954 and totaled over 189,000 tons.

Producers continue to cut back on mine and smelter output and their cumulative effect will be visible in the March figures. The industry is hopeful of an early release of the long-delayed recommendations of the Tariff Commission and the Administration has asked that they be expedited. It is generally believed the Commission will call for an increase in the present duties on both lead and zinc, but it is questionable how much domestic prices will be affected, as the present spread between London and New York is very large. More than likely the London price will decline by the amount of the tariff, which will still permit profitable exports to this country. Imports of zinc last year amounted to 794,000 tons, a new record high, with most of the increase in slab. Business continues slow and is unlikely to improve while steel production remains at a depressed level.

No Pickup in Lead Demand

Lead demand is low. The price remains at 13 cents a pound, New York, but with London offering the metal at 9½ cents, producers are uneasy. It is virtually certain that cessation of Government buying for the stockpile would cause a sharp collapse in the price and there is no assurance that such buying will continue indefinitely. Hence, the industry is vitally concerned over prospects for a higher tariff. Under the present legislation the tariff could be increased from its current rate of 1.06 cents per pound to 2.55 cents. Legislation sponsored by the Administration in 1957 suggested a peril point of 17 cents a pound for lead above which no tariffs would be payable. Stocks of lead in the hands of smelters and refiners continue to rise.

Aluminum Demand Unsettled

Executives of two leading aluminum producers declared that business in January and February was better than expected but March was rather disappointing. Customers want quick delivery on orders. There is no immediate prospect of a cut in the price of primary metal. Producers are unwilling to disturb the well-established price stability of aluminum to which they point pridefully in contrast to the violent fluctuations in copper, lead, and zinc. They assert that recovery in demand for their metal is likely to run well ahead of a general business revival and that they will market more of their products in 1958 than last year.

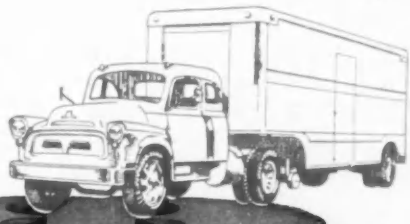
This may be over-optimistic as production will be increased this year by the entry of Ormet Corp., scheduled to reach full capacity of 180,000 tons a year by the fourth quarter with some output from pot lines coming in March. And the announcement that Kaiser Aluminum was cutting output because of general economic conditions and a continuing oversupply of aluminum adds more uncertainty. It is estimated that the total cutbacks would represent about 28 per cent of Kaiser's installed capacity which is the second largest in the country.

The Aluminum Association esti-

(*Turn to page* 109, *please*)

Rapidly becoming the

Standard of the Automotive Industry



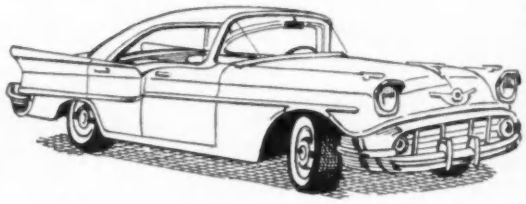
INCREASES ENGINE LIFE UP TO 400%

STERLING'S great "Conformatic" piston with "Intra-Cast" steel ring groove liners give sensationally longer life to rings and grooves—

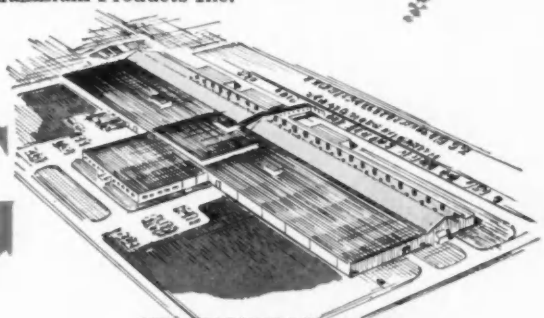
Recommended clearances for "Conformatic" pistons are from 0 to ½ thousandth inch. This clearance is maintained hot and cold providing unbelievable bore stability.

STERLING'S CONFORMATIC PISTON WITH INTRA-CAST STEEL LINED GROOVES

prevents frictional horsepower loss, reduces oil consumption to an absolute minimum, and prolongs engine life up to 400%. *Intra-Cast* and *Conformatic* are registered trade names of STERLING Aluminum Products Inc.



Sterling's revolutionary *Conformatic* piston already has been accepted and is now being used in a number of America's finest and most popular passenger cars.



NEW MANUFACTURING FACILITIES FOR STERLING ALUMINUM

120 acres! Completely new automated plant at the confluence of the Missouri and Mississippi Rivers

STERLING

ALUMINUM PRODUCTS INC.

ST. CHARLES, MISSOURI

SA-1

WORLD'S LARGEST MANUFACTURER OF ALUMINUM ALLOY PISTONS

• • INDUSTRY STATISTICS • •

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make of Car	Weeks Ending March 15	Weeks Ending March 8	Year to Date 1958	Year to Date 1957
PASSENGER CAR PRODUCTION				
Rambler	3,689	.....	34,872	19,987
Total—American Motors Corp.	3,689	.....	34,872	19,987
Chrysler	1,212	1,083	12,759	33,911
De Soto	1,721	174	9,092	37,708
Dodge	3,018	1,093	20,315	70,314
Imperial	375	329	3,731	9,855
Plymouth	9,372	7,567	82,491	161,488
Total—Chrysler Corp.	15,698	10,246	128,388	313,276
Edsel	8	451	3,295	.....
Ford	20,498	11,609	246,069	361,880
Lincoln	829	861	8,342	12,818
Mercury	.....	3,920	27,645	86,723
Total—Ford Motor Company	21,335	16,841	285,351	461,421
Buick	4,293	6,371	71,882	122,839
Cadillac	3,226	3,126	32,618	35,962
Chevrolet	28,273	31,827	336,886	343,156
Oldsmobile	5,700	8,516	89,285	111,500
Pontiac	4,117	5,713	66,213	97,856
Total—General Motors Corp.	45,609	55,553	596,864	711,313
Packard	.....	125	929	3,526
Studebaker	120	1,097	5,674	12,353
Total—Studebaker-Packard Corp.	120	1,222	6,603	15,879
Checker Cab	91	92	780	831
Total—Passenger Cars	86,542	83,954	1,052,858	1,522,707
TRUCK AND BUS PRODUCTION				
Chevrolet	6,536	6,380	61,747	79,523
G. M. C.	1,256	1,245	13,586	16,488
Diamond T	105	105	1,162	860
Divco	60	60	624	845
Dodge and Fargo	1,291	1,093	11,473	19,032
Ford	4,577	4,091	51,006	68,405
F.W.D.	35	33	274	261
International	141	2,319	23,793	18,599
Mack	356	234	3,090	3,947
Studebaker	303	234	2,428	2,389
White	354	347	4,012	4,358
Willys	1,989	1,785	17,104	16,834
Other Trucks	60	65	650	955
Total—Trucks	17,063	17,991	190,949	232,496
Buses	80	65	824	786
Total—Motor Vehicles	103,685	102,010	1,244,631	1,755,989

RETAIL CAR SALES BY PRICE GROUPS*

NUMBER OF CARS

Price Group	January 1958 Units†	January 1958 % of Total	January 1957 Units†	January 1957 % of Total
Under $2,000	1,236	.34	13,963	3.26
$2,001 to $2,500	225,362	62.05	248,704	58.07
$2,501 to $3,500	98,514	27.13	124,399	29.05
Over $3,500	38,069	10.48	41,212	9.62
Total	363,181	100.00	428,278	100.00

DOLLAR VOLUME OF SALES

Price Group	January 1958 Dollars	January 1958 % of Total	January 1957 Dollars	January 1957 % of Total
Under $2,000	$ 2,131,070	.22	$ 27,314,845	2.51
$2,001 to $2,500	530,591,417	54.15	539,886,198	49.62
$2,501 to $3,500	277,331,744	28.31	345,853,495	31.79
Over $3,500	169,704,426	17.32	174,957,945	16.08
Total	$979,758,657	100.00	$1,088,012,483	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four-door sedan or equivalent model. Does not include transportation charges or extra equipment.

†—New registrations of American made cars only. Does not include imported foreign cars.

REGISTRATIONS OF FOREIGN CARS

January

1958		1957	
Volkswagen	5,263	Volkswagen	4,402
Renault	2,242	M. G.	810
English Ford	1,643	Metropolitan	585
Hillman	987	Hillman	508
M. G.	863	Volvo	480
All Others	8,295	All Others	2,779
Total	19,293	Total	9,564

1958 NEW REGISTRATIONS

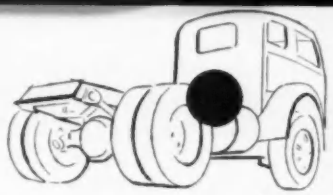
Based on data from R. L. Polk & Co.

NEW PASSENGER CARS

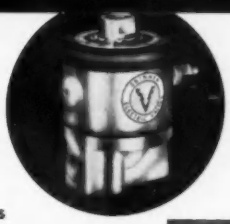
Make	January 1958	December 1957	January 1957
Chevrolet	104,028	140,103	101,116
Ford	79,738	129,800	110,454
Plymouth	32,900	37,425	41,262
Oldsmobile	29,679	38,156	31,787
Buick	27,283	36,217	35,013
Pontiac	21,847	26,064	24,015
Dodge	11,667	15,604	18,442
Mercury	10,954	14,886	19,215
Cadillac	10,853	13,323	11,609
Rambler	8,853	9,272	5,210
Chrysler	6,286	10,140	8,206
De Soto	5,049	6,840	8,462
Edsel	5,028	5,531	.....
Studebaker	3,516	4,501	5,051
Lincoln	2,904	2,582	3,078
Imperial	1,992	.....	2,233
Metropolitan	647	780	585
Packard	250	217	363
Misc. Domestic	228	1,630	2,042
Foreign	18,646	20,865	6,979
Total—All Makes	381,932	512,136	437,320

NEW TRUCKS

Make	January 1958	December 1957	January 1957
Chevrolet	17,849	20,350	20,820
Ford	14,616	18,781	13,296
International	7,522	7,534	7,539
G. M. C.	3,923	4,476	5,175
Dodge	3,033	4,250	3,881
Willys Truck	976	1,473	1,367
Mack	845	1,022	1,016
White	810	715	1,253
Willys Jeep	419	668	506
Studebaker	390	408	697
Diamond T	193	312	308
Divco	122	125	203
Kenworth	72	44	61
Brockway	62	56	51
F. W. D.	40	27	51
Peterbilt	21	26	45
Misc. Domestic	68	215	116
Foreign	1,609	1,676	594
Total—All Makes	52,368	62,160	56,979

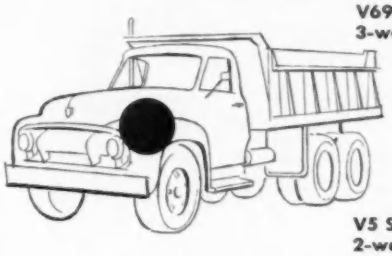


V69 Series
3-way

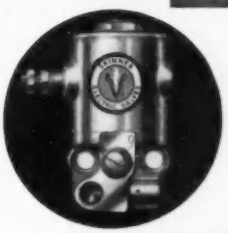


FOR SADDLE TANK OPERATION

On trucks equipped with saddle tanks, the Skinner V69 Solenoid Valve can make fuel level readings and tank switching a one-step, push-button operation.

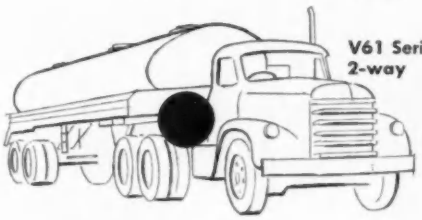


V5 Series
2-way

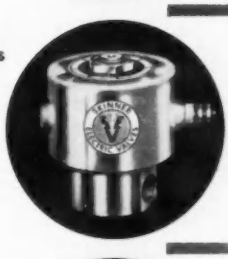


FOR DIESEL CUT-OFF

On diesel trucks, the Skinner V75 Solenoid Valve can be used to automatically shut the engine down by cutting off the fuel to the injectors.

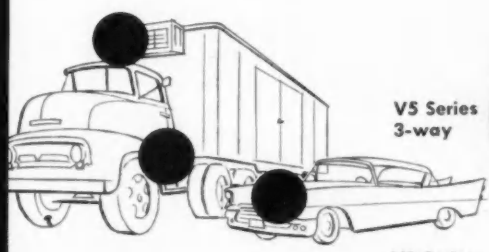


V61 Series
2-way



FOR PROPANE AND BUTANE CUT-OFF

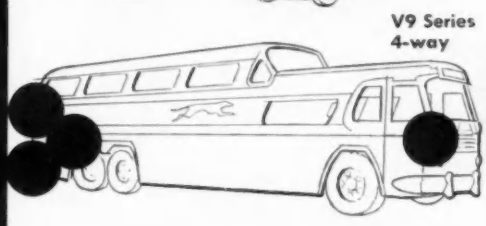
On high pressure propane and butane trucks, the Skinner V61 Solenoid Valve can be used to automatically shut off the tanks from the fuel system when the vehicle is not in operation.



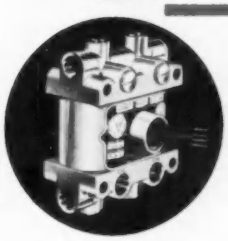
V5 Series
3-way

FOR AIR AND HYDRAULIC CONTROL

Skinner V5 Solenoid Valves are employed to control the operation of cylinders, diesel racks, clutches, brakes, governors, transmissions; also heating, refrigerating, fuel and air suspension systems.



V9 Series
4-way



FOR SWITCH CONTROL

Skinner V9 Solenoid Valves can be used with confidence in conjunction with centrifugal, thermal, ignition and limit switches to automatically perform such sequencing, interlocking and safety functions as door opening and closing, ventilation, air conditioning, etc.

Skinner Solenoid Valves can help you solve many different control problems

No matter what your control problem is, chances are a Skinner Solenoid Valve can solve it. "On-the-road" tests show these valves can take it under all conditions.

In addition to quality and simplicity of design, Skinner Solenoid Valves have features that assure long, uninterrupted operation of any system which uses them.

If your problem is fuel control, air conditioning, ventilation, door opening or closing, suspension, fuel injection, etc., consider the use of Skinner Solenoid Valves — there are over 100,000 variations available, which means custom design from standard parts. Let our application engineering department show you how they can meet your specific requirements.

For complete information, write us at Dept. 334 or contact a Skinner Representative (they are listed in the Yellow Pages).

Skinner Solenoid Valves are distributed nationally

SKINNER ELECTRIC VALVES

SKINNER ELECTRIC VALVE DIVISION

NEW BRITAIN
CONNECTICUT

105 EDGEWOOD AVENUE

THE CREST OF QUALITY

ON OUR WASHINGTON WIRE

The Pentagon may soon scalp some of its civilian chiefs. Defense Dept. has under study reorganization plan to eliminate 14 assistant defense secretaries. Should the plan bog down, Congress is ready to move in with a new law to do the same thing.

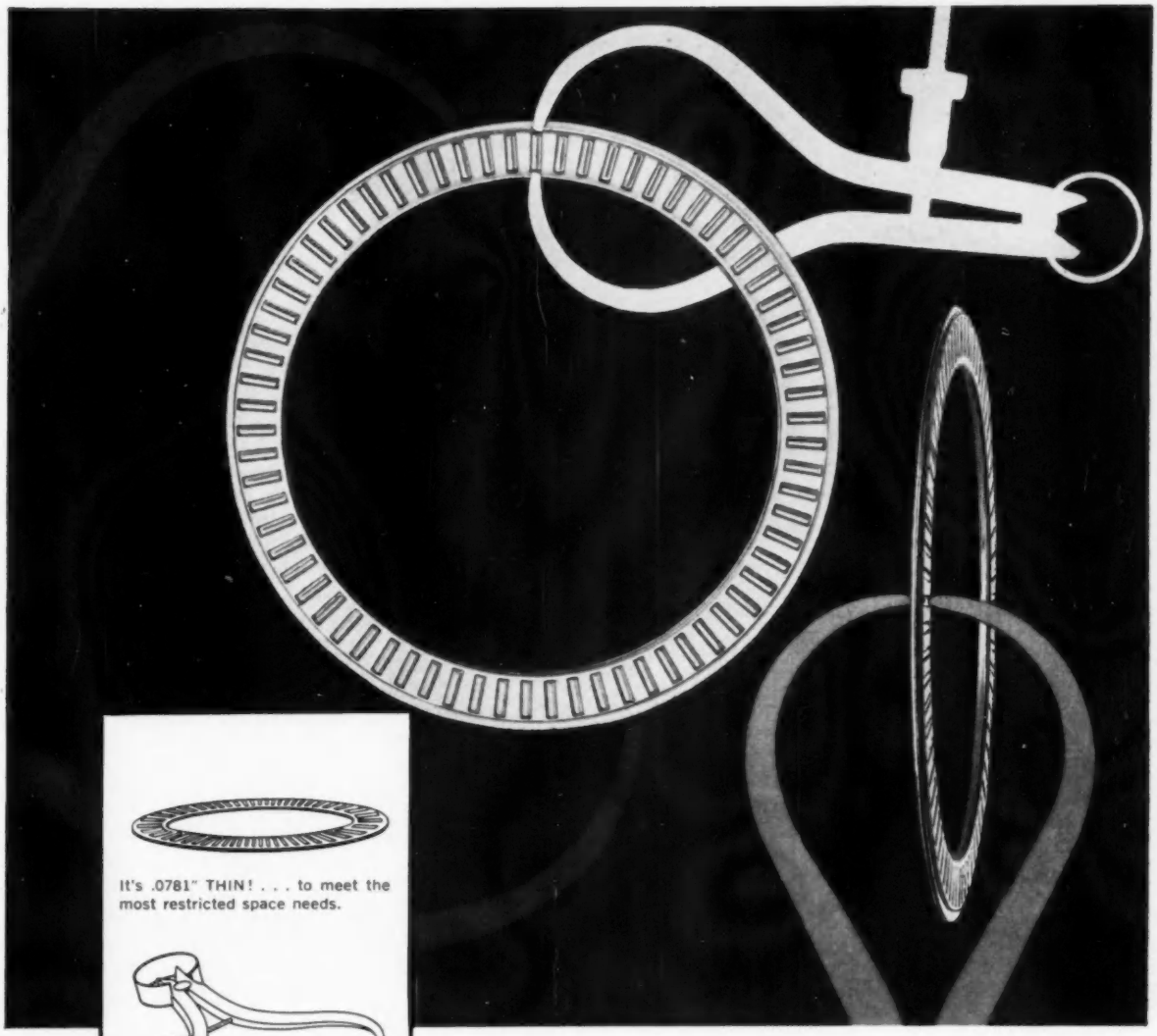
Congress grows more indignant over Pentagon blunders in missile management and planning. Defense Secretary McElroy admits it's a case of too many cooks spoiling the broth. What's coming: Drastic reduction in list of bureaucrats (many of them almost totally ignorant of aircraft engineering) permitted to issue orders to plants.

Manned aircraft still must be figured in both offense and defense plans. Whatever the Russians say, they aren't scrapping manned bombers, warns the U. S. Air Force. If we ignore defense against bombers, we're in grave danger.

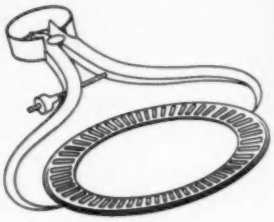
USAF itself says it isn't going overboard in switching to unmanned weapons. Instead it's considering a fleet of atomic planes to fly a constant defense patrol.

Tax reduction—if it comes this year—is likely to take the form of a flat-sum reduction for individual taxpayers. A cut of $50 per person is the figure most discussed in congressional taxwriting circles.

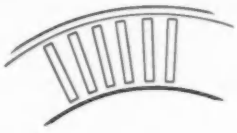
The Treasury Dept. is openly dismayed by this approach to tax reduction. T-men point out that the loss of revenue to the Government would add up to nearly $3.5 billion. And a tax cut for $50, spread out over a year's pay periods, would seem like chicken feed to individual taxpayers, it is pointed out.



It's .0781" THIN! . . . to meet the most restricted space needs.



OD is much smaller, for given shaft size, than other types of thrust bearings.



Needle-proportioned rollers provide large contact area in minimum cross section.

By Every Measure . . . Ideal For Compact Thrust Applications

Whether you gauge its value in compactness, high anti-friction efficiency, high thrust capacity, or low unit cost, you will find the new Torrington Needle Thrust Bearing measures up ideally to your needs.

This needle-type bearing is designed specifically for thrust loads in restricted space. It may run directly on adjacent hardened and ground surfaces or on standard thrust races. Used alone, or in combination with Torrington radial type Needle Bearings, the Needle Thrust Bearing finds wide use in many applications including steering gears, hydraulic pumps, tractor bolsters, bevel and worm gear boxes, governors, outboard motors, 2-cycle engines, washing machines, power tools, torque converters, and automatic transmissions.

For engineering information and assistance in design, please call upon the services of Torrington's Engineering Department. **The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.**

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • BALL • NEEDLE ROLLERS • THRUST

SHORTIES

The Mountain and Pacific states have the highest percentage of car-owner families, while car ownership is lowest in New England and Middle Atlantic states.

●

Seventy-five per cent of the cars on the road have radios, 47 per cent have automatic transmissions, 14 per cent have power brakes, and 12 per cent have power steering.

●

Thirty-five per cent of new cars and 40 per cent of used cars were purchased with cash.

●

Tubeless tires are now used on 35 per cent of the cars on the road. Twenty per cent of all cars are equipped with snow tires during the winter months.

●

More than six billion dollars worth of automotive products are produced in industries other than the motor vehicle industry. More than 330,000 people are employed in this production.

●

Special taxes collected from truck users in 1957 amounted to $2.25 billion. This exceeded total taxes collected on passenger cars, trucks and buses combined, in any year prior to 1946.

●

The average farm pick-up truck pays $47 in state taxes. At the other extreme, an average five-axle Diesel truck combination doing contract hauling pays $2,813 in state taxes each year.

●

Four out of five truck owners have only one truck. One out of 14 own three or more.

●

Some 24,400 U. S. cities receive and deliver all mail by motor truck. There are also 32,000 rural mail routes, covering 1,575,000 miles of road.

Speaking of Records

. . . *our* records show that when a manufacturer once discovers the exceptional and uniform quality of Roebling flat spring steel, he becomes a permanent Roebling customer.

Your records for faster production and lower costs can be improved, in large measure, by Roebling's strict attention to supplying you with the finest flat spring steel available. When you need flat spring steel, specify Roebling. Write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

These are typical of the many types of quality parts produced from Roebling flat spring steel.

ROEBLING

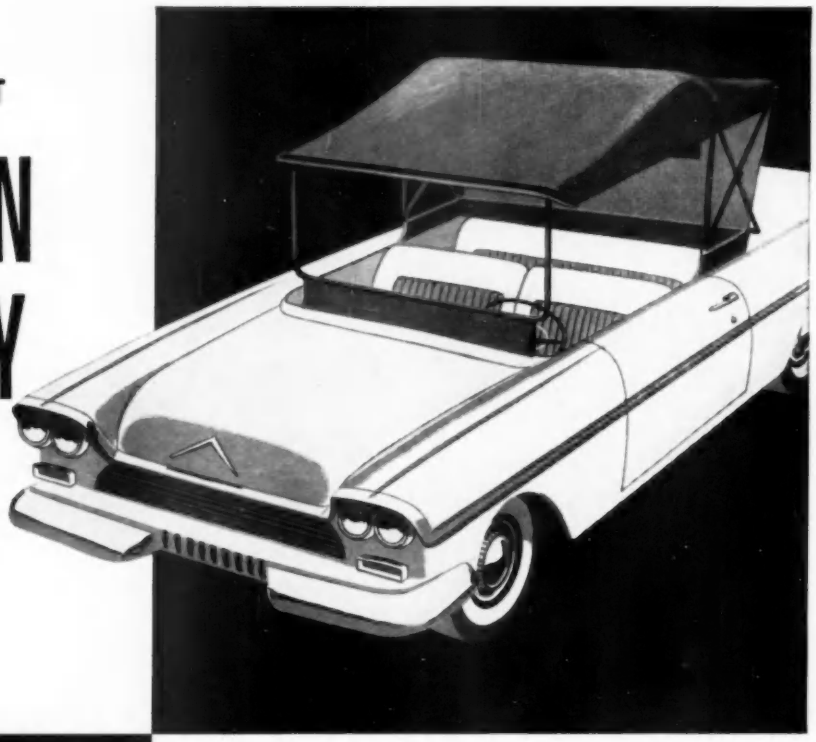
Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

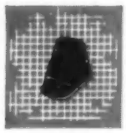
Roebling... Your Product is Better for it

IS YOUR PRODUCT

MODERN IN EVERY WAY

EXCEPT ONE?*





*Have you a power transmission application on the products you make . . . or on the machines you use to manufacture them? Then you'll want to know about the unique advantages offered by Formsprag clutches. As you probably know, modern Formsprag clutches are already rapidly replacing old-fashioned ratchet-and-pawl mechanisms as well as their roller-type successors.

But are you aware of the reasons behind this widespread preference among industrial designers for the Formsprag clutch? Well, its patented sprag principle, for example, allows a Formsprag clutch to deliver more torque per cubic inch of displacement than any other power transmission unit currently available. Add this to ease of installation, low maintenance costs, and longer life—plus its basically simple design which makes prototype testing economical—and you have the prime reasons for Formsprag's superiority in the field of power transmission.

For complete information: send for your personal copy of the newest Formsprag catalog.

FORMSPRAG COMPANY

23595 HOOVER ROAD, WARREN (DETROIT), MICHIGAN—IN CANADA: RENOLD CHAINS CANADA LTD.—IN UNITED KINGDOM: RENOLD CHAINS LTD.

Designers, engineers and manufacturers of the modern sprag type over-running, indexing, and backstopping clutches for aircraft, automotive, and various industrial applications.

58-R

METALS

(*Continued from page* 100)

mates 1957 production was 1,647,710 tons, slightly less than 1956. Consumption is believed to be higher than shipments would indicate as inventories are reduced.

Nickel in Good Supply

Nickel shortages are over. This was reflected by International Nickel's decision to cut output by 10 per cent a month. A company spokesman said stocks of nickel are expected to continue to climb and unless business shows a quick uptake a further cut must become necessary. It was pointed out that the present rate of nickel production is potentially in excess of total market demands as well as consumption. International Nickel ore contains about as much copper as nickel, so the 10 per cent cutback of the nickel output will also mean the same cutback in copper production, a development that no doubt will cause considerable satisfaction to copper producers.

Discussing the nickel situation before the National Association of Purchasing Agents, a speaker declared that a two-month inventory based on the present production rate should suffice. He estimated that the amount of premium priced nickel is about 12 per cent of the total, or 12 million pounds a year. However the main reason for the present ample supply of nickel is the release of Government-purchased metal for the stockpile. Most of this nickel will probably be in a pool from which it would be released to private industry at cost. It appears that nickel consumption in a missile program would require less than for airplanes, but this is unpredictable at present. Hence nickel consumers should hope that producers would keep a very large inventory on hand to take care of a sudden demand if the Government should revise its needs and at the same time be able to provide for calls from industry.

CONFERENCE PROGRAM

(*Continued from page* 73)

WEDNESDAY, APRIL 16 (Concurrent)

MECHANICAL SESSION

Chairman—C. T. Blake, The Warner & Swasey Co.

Vice Chairman—G. A. Nothman, Armour Research Foundation

"Problems in Designing Automatic Machinery," M. J. Faltot, New Jersey Machine Co.

"Lubricant Considerations in Centralized Systems," R. K. Gould and R. D. Skoglund, Texas Co.

MATERIALS SESSION

Chairman—Walter Starkey, Ohio State University

Vice Chairman—N. E. Bateson, Pullman-Standard Car Mfg. Co.

"Compatibility of Metals in Bearing Contact," C. L. Goodzeit, General Motors Research Staff

"High Strength Structural Sandwich Construction," W. E. Dirkes, Wright Air Development Center, U. S. Air Force

POWER AND CONTROL SESSION

Chairman—E. M. Ramberg, Titeflex, Inc.

Vice Chairman—Sidney Davis, consulting engineer

"Integrating Mechanical and Electrical Design in Servo Systems," W. L. McCann, Giddings & Lewis Machine Tool Co.

"Solving Mechanical-Electrical Problems in Servo Systems," Glenn Ertell, General Electric Co.

THURSDAY, APRIL 17

GENERAL ENGINEERING SESSION

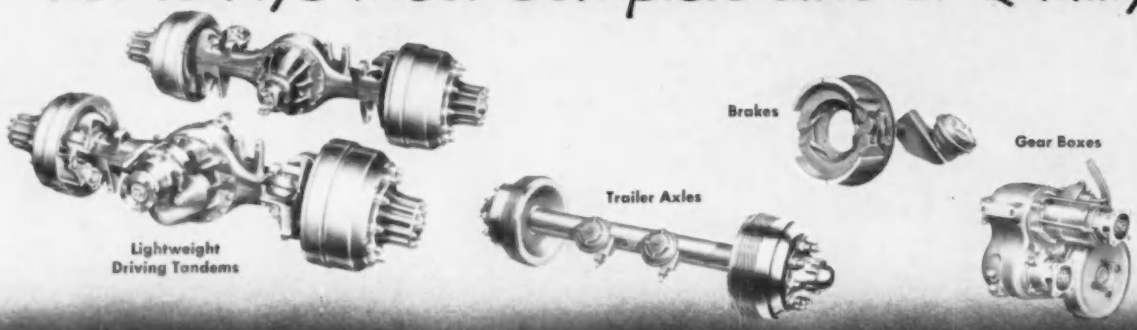
Chairman—William Budington, John Crear Library

Vice Chairman—E. H. Cann, Eastman Kodak Co.

"The Information Center of Tomorrow," Allen Kent and J. W. Perry, Western Reserve University

"A Central Catalogue File Saves Engineering Time and Money," J. L. Dykes, E. I. duPont de Nemours & Co.

For Today's Most Complete Line of Quality



SPECIFY... TIMKEN-DETROIT®

Whatever your requirements for highway or off-the-road-equipment... Timken-Detroit offers you a full line of torture-tested axles and brakes, both proven by almost 50 years of field testing and laboratory research!

Timken-Detroit manufactures today's most complete line of driving, trailer and front axles, plus brakes and gear boxes . . . with a full range of capacities in each product line.

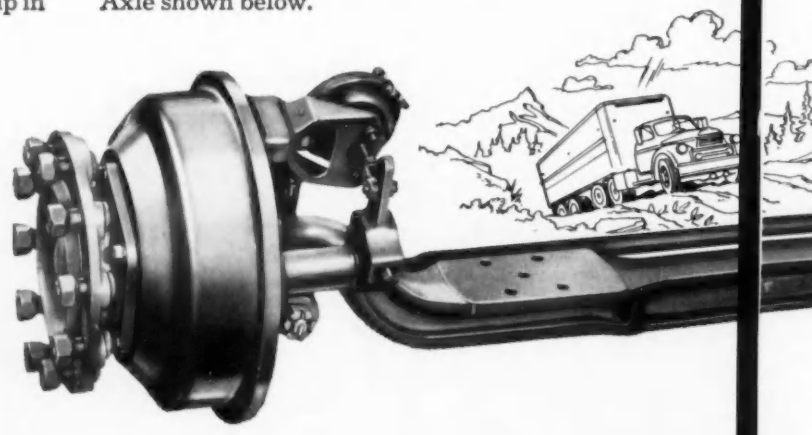
As a prime supplier to this nation's automotive industry for nearly 50 years—Timken-Detroit has learned the exacting needs of the trucking industry. The result: TDA® Axles and Brakes mean leadership in quality, service, safety and dependability.

Today we are manufacturing the industry's most complete line of front axles . . . ranging in capacity from light commercial vehicles to the heaviest off-highway applications.

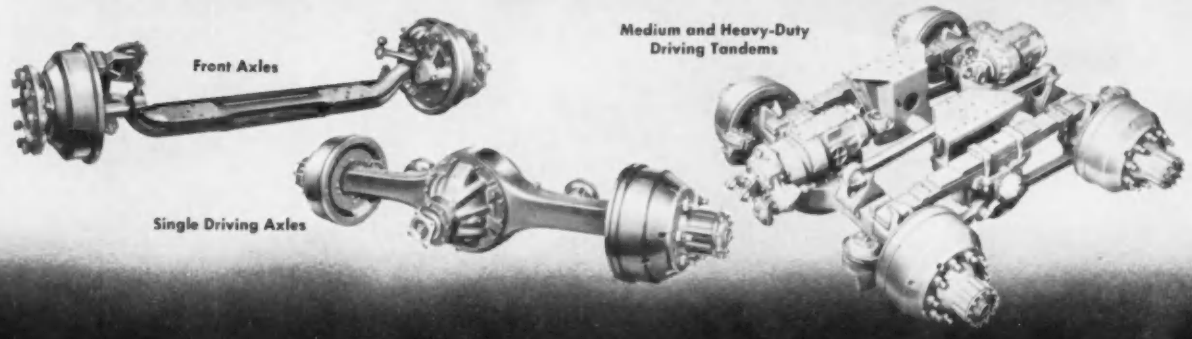
An example of the engineering features and superior quality built into every Timken-Detroit product is the F-900 Front Axle shown below.

Plants at: Detroit, Michigan
Oshkosh, Wisconsin • Kenton and Newark, Ohio
New Castle, Pennsylvania

TIMKEN Detroit AXLES
TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
DETROIT 32, MICHIGAN
Accepted TDA Standard



Axles and Brakes for Commercial Vehicles



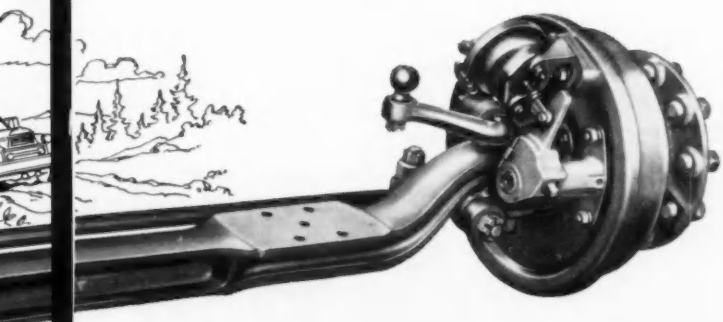
Products of

Rockwell Spring and Axle Co.

TIMKEN-DETROIT FRONT AXLES OFFER YOU GREATER STABILITY, SAFETY AND SERVICE!

You get better vehicle performance—under all conditions—with the F-900 Series Front Axles. Superior Timken-Detroit design and construction features give you front end stability—maximum strength and balance.

These improved Front Axles reduce driver fatigue . . . make steering easier . . . hold the driving path better . . . offer greater maneuverability . . . and contribute to increased vehicle life and superior performance.



Forged Axle Centers of high carbon steel are specially hardened for greater strength. The unique "Equalized-I" design between the spring pads provides uniform resistance to both horizontal and vertical forces.

Forged Knuckles of Alloy Steel are hardened for best metallurgical characteristics . . . are of improved design with large size spindles. A generous fillet where the spindle joins the knuckle body gives additional stiffness. These design features along with shot peening assure utmost strength.

Forged Steering and Tie Rod Arms are also of alloy steel and hardened. Stub arm design with carefully proportioned sections give these arms extra stamina and rigidity.

True Sphere Ball Studs in steering and tie rod arms have generous radii for maximum strength, and are induction hardened for long wear.

WORLD'S LARGEST MANUFACTURER OF AXLES FOR TRUCKS, BUSSES AND TRAILERS

The Newest ACME Model HA THREADING MACHINE

ACME Model HA (heavy duty) Single Spindle Threading Machine 2" capacity.

New Design

New Production Features

New Built-in Precision

New Versatility

Wide Speed Range: The Acme Model HA has eight spindle speeds assuring correct speeds for various diameters and materials to be threaded.

Adjustable Carriage: Adjustable both horizontally and vertically to permit alignment with the die head.

Hardened and Ground Ways: Rectangular ways guide and support the carriage insuring precision alignment and smooth carriage travel.

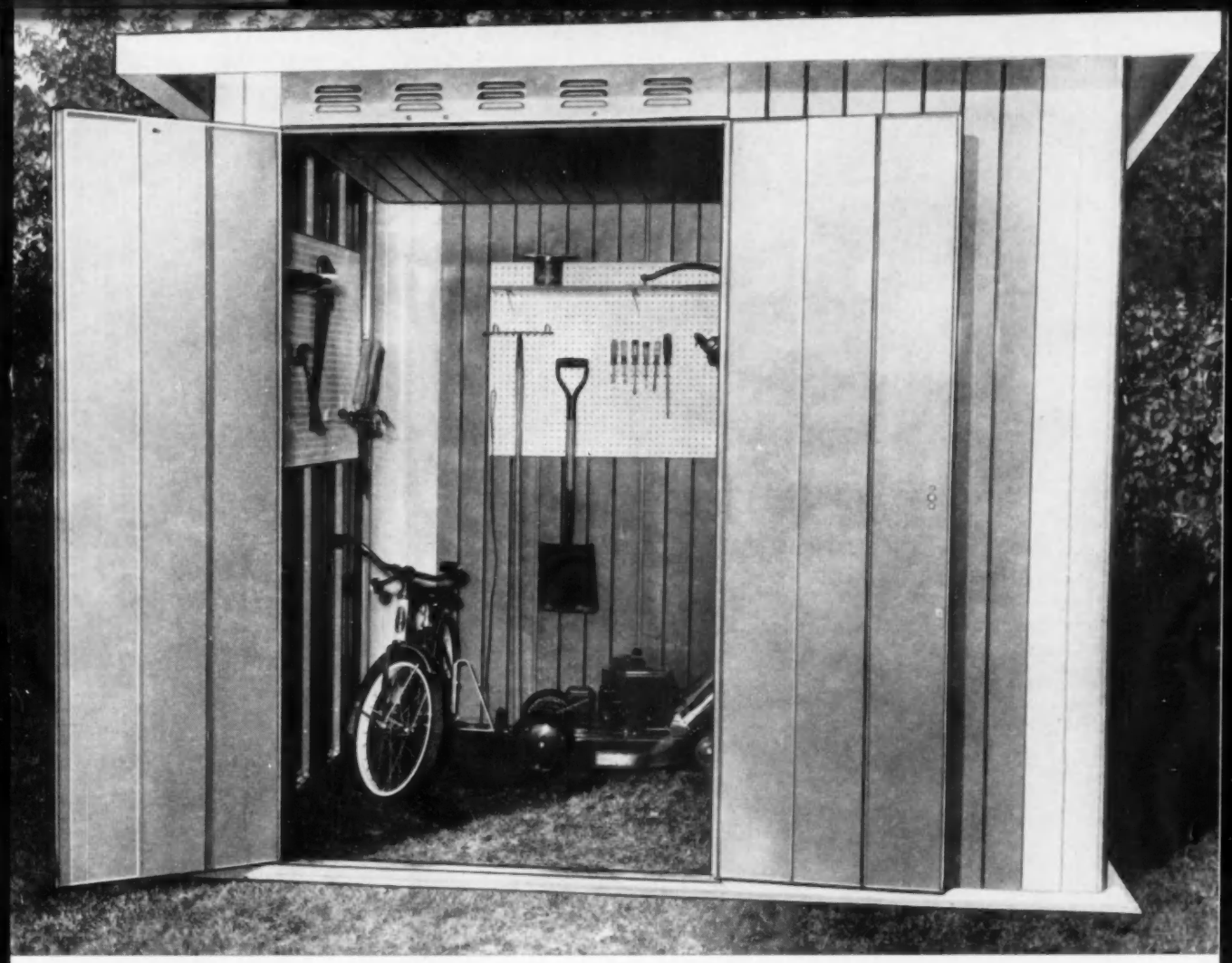
Ask for bulletin HAT giving description and complete specifications.

The Acme Model HA is adaptable to either tangential or hob type die heads using tangential or hob type chasers of standard design. Model HA Threaders are built in 1", 1½", 2" and 2½" capacities in single or double spindle design.

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • **1209 W. 65th St., Cleveland 2, Ohio**
ESTABLISHED 1882

"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING & POLISHING MACHINES
HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES



"WEIRZIN® ARRESTS CREEPING CORROSION,"

SAYS CHIEF ENGINEER OF GRAND SHEET METAL PRODUCTS COMPANY, MELROSE PARK, ILL.

"Especially designed to withstand wind, weather, fire and rough handling." That's the manufacturer's description of a Grand Handy House. Metal used? Weirzin.

But listen to what else Grand Sheet Metal Products Company has to say about Weirzin electrolytic zinc-coated steel, as used in their outdoor storage-shelter-utility Handy Houses. From Chief Engineer Edward Rawson:

"Weirzin material provides a very good surface for maximum paint adherence, which is most important for an outdoor application such as ours.

"High corrosion resistance is also of the utmost importance. Weirzin answers this requirement very well since it arrests any creeping of corrosion where the surface may become scratched or abraded in service. In other words, the corrosion will not tend to spread beyond the damaged area."

What about your products? Have you considered lately how they can be improved economically? Send for free brochure on Weirzin for both outdoor and indoor use. Write Weirton Steel Company, Department T-15, Weirton, West Virginia.

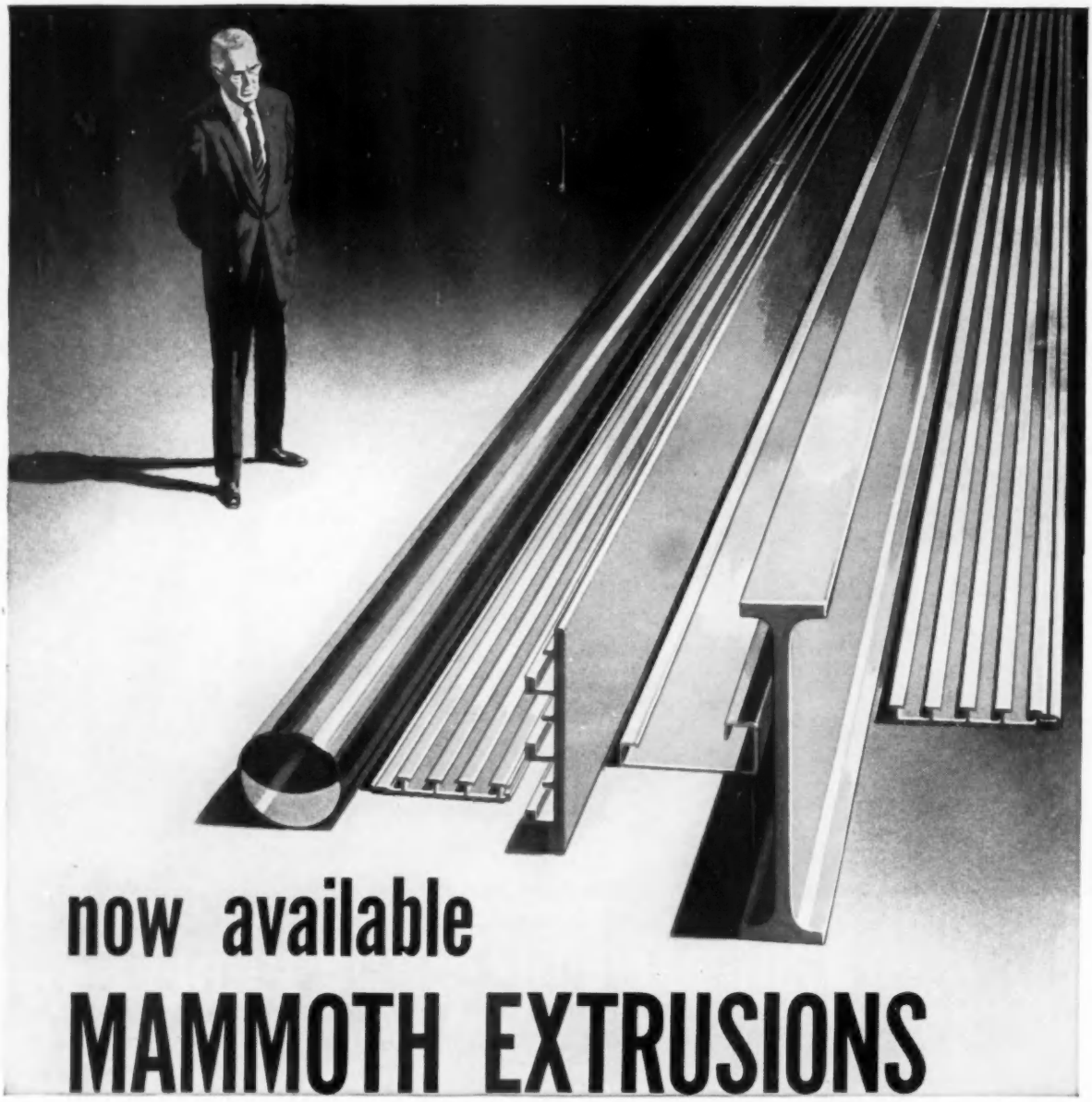
WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY

WEIRTON, WEST VIRGINIA

a division of

NATIONAL STEEL CORPORATION



now available
MAMMOTH EXTRUSIONS

Big magnesium and aluminum extrusions produced from Dow's 13,200 ton press

A whole new range of king-size dimensions is now available for design engineers. Dow's new 13,200 ton extrusion press at Madison, Illinois, is producing "special" sizes for quick delivery. These projects include work for aircraft and missiles, automotive, building, and highway construction.

Here's what the big press can do in the way of magnesium and aluminum extrusions to meet your special requirements.

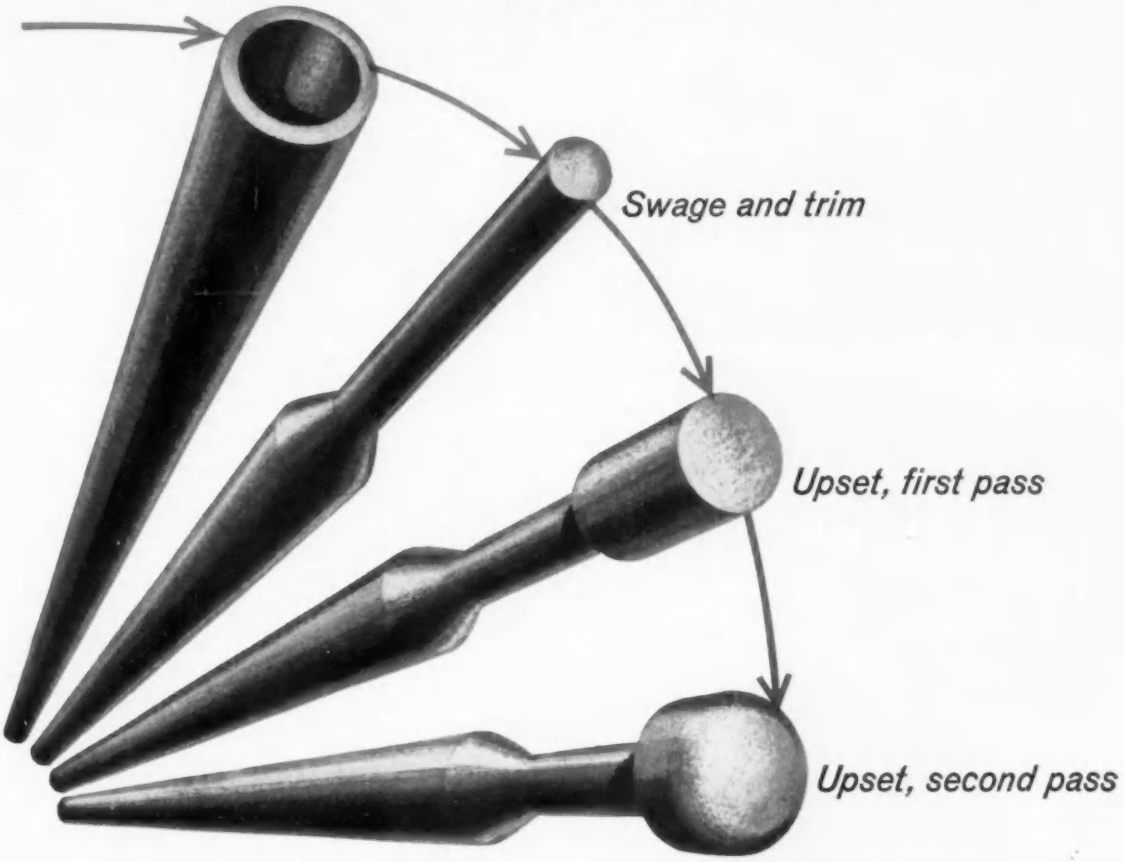
Check this list:

1. **LARGER EXTRUSIONS. Sizes up to a circumscribing circle of 30"**
2. **LONGER EXTRUSIONS. Up to 80 feet in length**
3. **THINNER SECTIONS. Down to 0.125"**
4. **STEPPED EXTRUSIONS. Solid or hollow**
5. **COMBINED HOLLOW EXTRUSION-FORGINGS**

***FOR DESCRIPTIVE LITERATURE** on the big press, contact your nearest Dow sales office, or write The Dow Chemical Company, Midland, Michigan, Dept. MA 1401R-E.*

YOU CAN DEPEND ON DOW

Start with OSTUCO TUBING



and end up with a 34% *saving*

Here's a cost-cutting case history right in the Ohio Seamless mill. It proves we take our own medicine—*and like it.* You may, too.

Formerly, mandrels for rolling Ostuco Tubing on our Assel mill were made from two pieces. A shaped end, hogged out of solid bar stock, was welded to a long tube. Expensive to machine, weld and process.

We decided to *forge the mandrels entirely from Ostuco Seamless Steel Tubing.* In three steps—swage, upset and finish-form—we now produce better mandrels . . . ready for use without any machining whatsoever, *and save 34% over former processing methods.*

Chances are good that Ostuco Tubing is the right prescription for slashing your production costs, too. For expert advice, contact our nearest sales office or our plant at *Shelby, Ohio—Birthplace of the Seamless Steel Tube Industry in America.*

AA-7225

Visit us at Booth 771—Design Engineering Show Chicago—April 14-17

SALES OFFICES: Birmingham • Charlotte • Chicago (Oak Park) • Cleveland Dayton • Denver • Detroit (Ferndale) • Houston • Los Angeles (Lynwood) Moline • New York • North Kansas City • Philadelphia (Wynnewood) • Pittsburgh Richmond • Rochester • St. Louis • St. Paul • St. Petersburg • Salt Lake City Seattle • Tulsa • Wichita

CANADA: Railway & Power Engr. Corp., Ltd.

EXPORT: Copperweld Steel International Company 225 Broadway New York 7, New York

FIFTY YEARS OSTUCO TUBING 1908 1958

OHIO SEAMLESS TUBE DIVISION

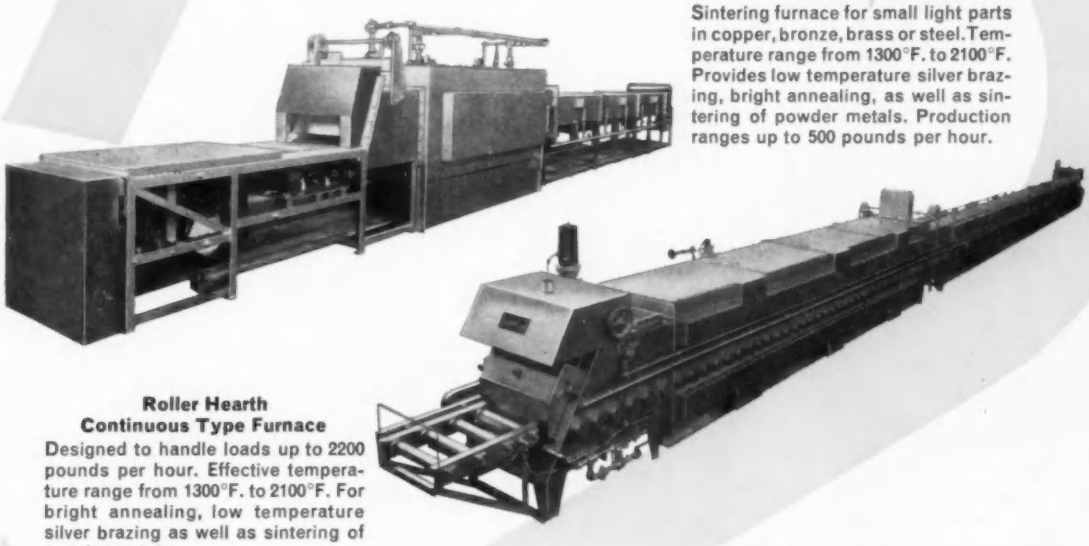
of Copperweld Steel Company • SHELBY, OHIO

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

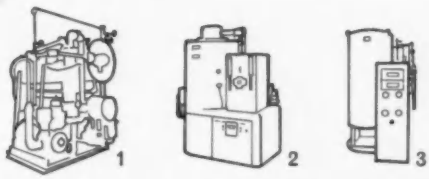
Look to Lindberg for sintering furnaces

Hand Pusher Batch Type Furnace
For small production lots and experimental sintering. An all-purpose unit for operation from 1300° F. to 2500° F. Made in various sizes for sintering from 25 to 300 pounds per hour.

Mesh Belt Continuous Type Furnace
Sintering furnace for small light parts in copper, bronze, brass or steel. Temperature range from 1300°F. to 2100°F. Provides low temperature silver brazing, bright annealing, as well as sintering of powder metals. Production ranges up to 500 pounds per hour.



Roller Hearth Continuous Type Furnace
Designed to handle loads up to 2200 pounds per hour. Effective temperature range from 1300°F. to 2100°F. For bright annealing, low temperature silver brazing as well as sintering of powder metals.



Lindberg atmosphere generators provide the proper atmospheres recommended for use with Lindberg Sintering Furnaces. These are: 1. HYEX Generator... approximately 4% carbon dioxide—18% hydrogen—12% carbon monoxide and 66% nitrogen. 2. HYEN Generator... neutral atmosphere approximately 21% carbon monoxide—40% hydrogen—38% nitrogen and 1% methane. 3. HYAM Generator... composed of approximately 75% hydrogen and 25% nitrogen.

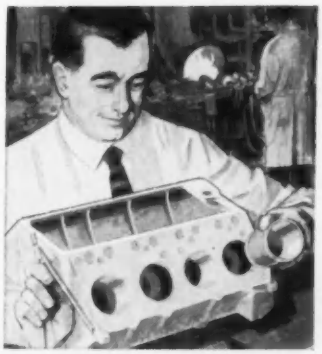
For sintering furnaces, just as in all types of industrial heating equipment, you can depend on Lindberg's ability to supply exactly the right equipment for your needs. Just get in touch with your nearest Lindberg Field Representative, or write Lindberg Engineering Company, 2491 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.

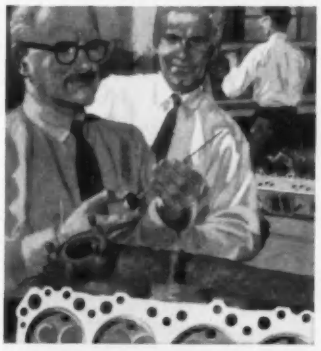
See Lindberg in Booth No. 12, Metal Powder Show in Philadelphia

LINDBERG heat for industry

More horsepower per pound – from the

Alcoa Aluminum engine





A distant dream? Not any more. Already the aluminum engine is standard on many foreign cars. Aluminum pistons, pioneered by Alcoa, have proved themselves in millions of cars now on the road. And the many other innovations that have come from Alcoa Development Division's Laboratories have enabled leading manufacturers to incorporate them in designs for an all-aluminum engine. Let's take a look at some of the developments that have made the all-aluminum engine possible—and desirable:

Cylinder Liners—As a result of more than a decade of experimentation, a recently announced hard coating of molybdenum sprayed on aluminum by the patented Metco "Sprabond" process gives it a wear resistance superior to iron. Development tests continue on other wear-resistant coatings and on special aluminum alloys.

Heads—Scores of tests conducted by Alcoa prove the advantages of aluminum heads. Exhaust valves have run an average of 125°F cooler at 4,000 rpm than in an iron head of identical design and compression ratio. Weight savings are as much as 40%, fuel can be four octane numbers lower. Heat is more evenly distributed, valves last four times longer.

Bearings—Alcoa has proved that solid aluminum bushings and bearings for connecting rods and mains have many bonus benefits. In a nonautomotive engine now in use, aluminum bearings are supporting 10,000 psi—far more than automotive bearings now support. And, because aluminum can support such high loads, bearing area can be reduced. This means you can design a stronger, stiffer, more durable crankshaft and have more throw space for balancing. Because aluminum is a good conductor and carries away heat fast, solid aluminum bearings can be operated at higher temperatures. Typical aluminum bushings sell for approximately the same price per pound as bronze, but you get three times as many bushings with aluminum.

Rocker Arms—To alleviate the problem of resonance and spring surge inherent in larger valve spring design loads, Alcoa designed a new aluminum rocker arm which weighs 40% less than malleable iron, reduces the accelerating forces required and permits a more resilient valve spring. This aluminum arm requires less machining because it can be die-cast to accurate tolerances.

LET ALCOA HELP

These are only a few of the many areas where Alcoa has pioneered in the development of the all-aluminum engine. As the most experienced producer of aluminum in the industry, Alcoa is in a unique position to help manufacturers design a completely new, lighter engine that will have improved weight and temperature distribution, better roadability and ease of handling. The complete facilities of Alcoa's laboratories and the knowledge and skills of its engineers are available to help *you* be first with the all-aluminum engine. Let us work with you. Write Aluminum Company of America, Development Division, 1848-D Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM gives every car more **GLEAM AND GO**

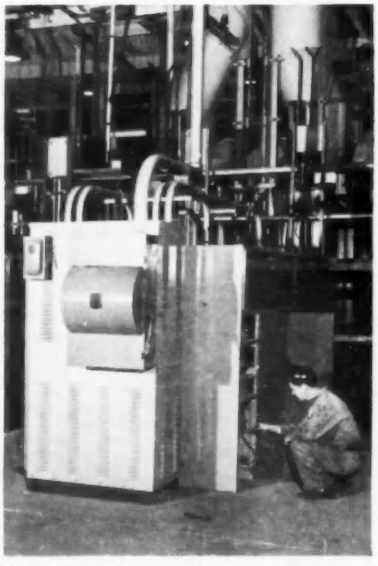
"ALCOA THEATRE"
Exciting Adventure, Alternate Monday Evenings

Art Pfeifer (left), Assistant to Rheem's Division Manager, discusses G-E germanium rectifier installation with J. A. Raskin (examining report), Vice President, and Norman Dieball, Electrical Engineer. Mr. Raskin and Mr. Dieball are of the L. H. Butcher Co., west coast subsidiary of Udylite Corp., which installed the automatic bumper plating line.

"General Electric Germanium Rectifiers.....

R. D. Scott, Udylite Corporation Chief Electrical Engineer, who assisted in planning, discusses Rheem's electrical system.

Rheem Automotive's new plant in Fullerton, Cal., has been in operation over a year plating bumpers, other auto parts.



Two 15,000-amp and two 20,000-amp rectifier cubicles, each 15 volts, feature compact construction, floor-mounting.

Light weight and "building block" flexibility of G-E automatic germanium plating rectifiers allow installation on overhead platforms, saving floor space. Inductrol* voltage regulators (left) allow efficient, economical, stepless, and automatic control, are integral part of system.

.....tops in automatic plating performance..."

says Art Pfeifer, Rheem Automotive Co., Fullerton, Cal., after year's successful operation

General Electric automatic germanium rectifiers are giving top performance after more than a year's continuous operation;—providing reliable, efficient DC power. So reports Art Pfeifer, Administrative Assistant to the Division Manager of Rheem Automotive Company's new Fullerton, California plant.

The largest installation of germanium rectifiers in the plating industry, this equipment produces 160,000 amperes of direct current at 15 and 18 volts. Each germanium unit is equipped with Inductrol automatic regulating control, making possible automatic voltage or current stabilization. Eighteen units (each rated 5,000 amperes at 18 volts) are mounted overhead to power nickel-plating tanks. Two 15,000-ampere and two 20,000-ampere units, each rated at 15 volts, are floor-mounted.

General Electric germanium rectifiers are lightweight, compact, and allow a "building block" arrangement designed for maximum installation flexibility and ease of maintenance. Floor space for each 5,000-amp unit is 17 square feet—less than 50 percent of a comparable motor-generator. Each unit weighs 5,000 pounds—approximately 40 percent of a comparable motor-generator. Each rectifier cubicle has General Electric's famous hermetically sealed rectifier cell for protection against corrosive atmospheres. All these advantages can be realized at a sizable initial cost saving over motor-generator sets.

The Rheem installation is one of General Electric's many germanium rectifier installations now totaling more than 75,000 kw.

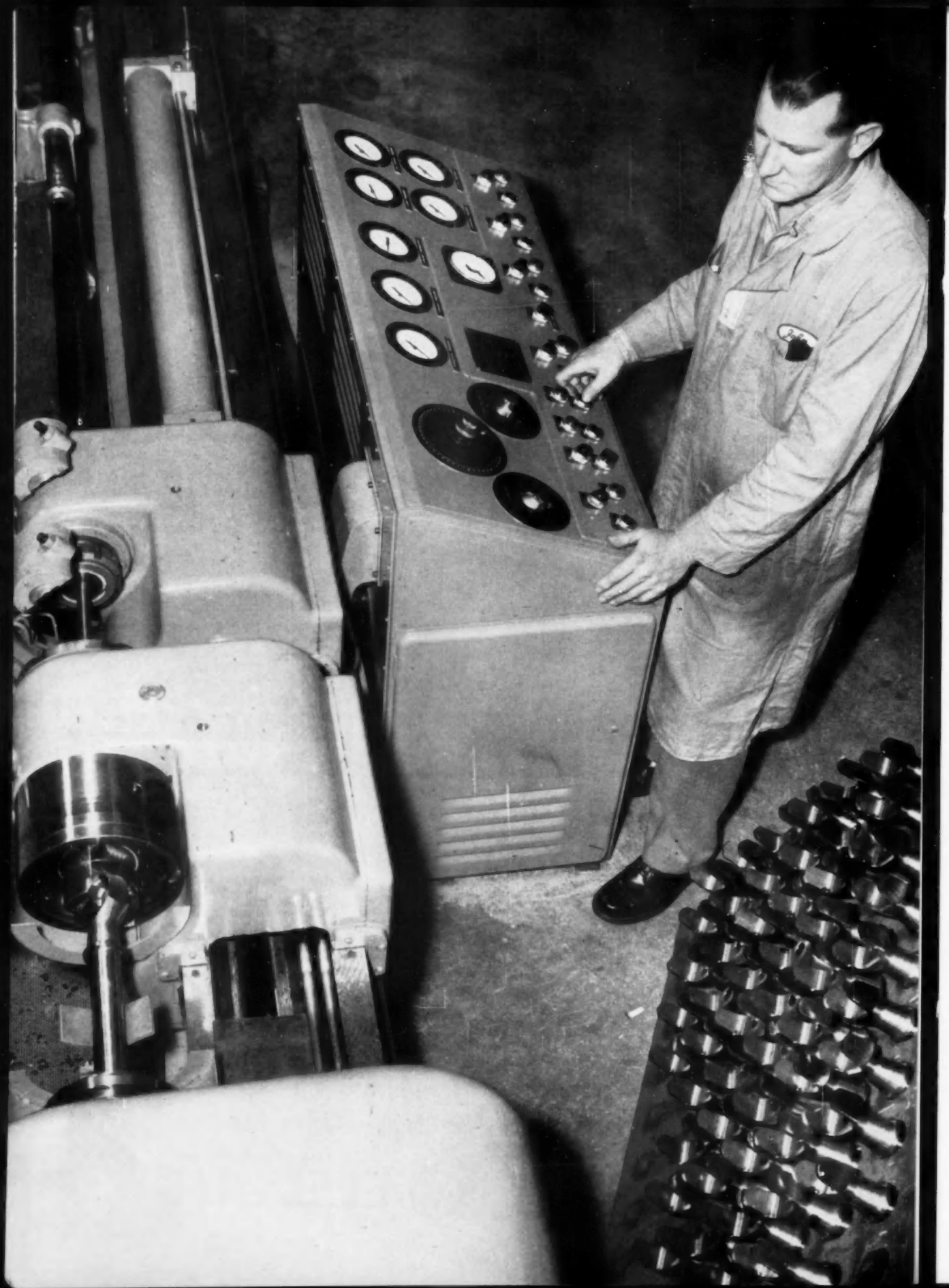
Let your plating agent show you how you, too, can benefit from the economy and efficiency of G-E plating rectifiers. General Electric Co., Schenectady 5, N. Y.

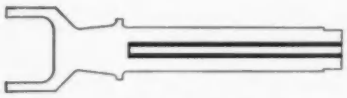
462-16

*Reg. Trade-mark of General Electric Company

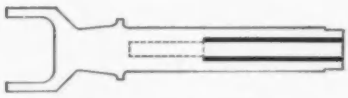
Progress Is Our Most Important Product

GENERAL ELECTRIC

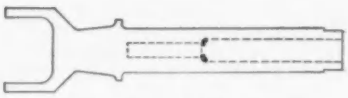




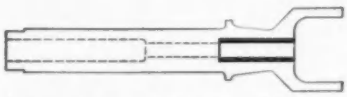
1. Solid bore—feed 5¾" per minute.



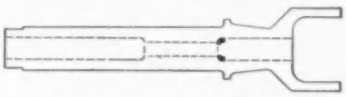
2. Counter bore—feed 8" per minute.



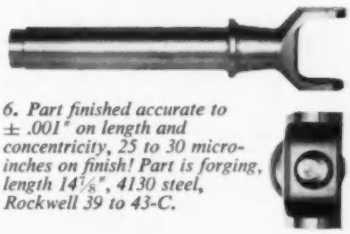
3. Form radius—feed 5¾" per minute.



4. Reverse part, solid bore—feed 5¾" per minute.



5. Form radius—feed 5¾" per minute.



6. Part finished accurate to ± .001" on length and concentricity, 25 to 30 micro-inches on finish! Part is forging, length 14⅛", 4130 steel, Rockwell 39 to 43-C.

This horizontal pin machined

8 TIMES FASTER . . .

on the Rapid Borer

Formerly, this aircraft part was rough drilled, reamed, radius formed, ground and honed. Operation called for turret lathe, grinder and honing machine. Even with experienced operators, incidence of spoilage was high because of precision requirements.

On the LeBlond-Carlstedt Rapid Borer, there is only one set-up. Part is completed, *finish bored* in 5 simple operations. Cycling is automatic. Workpiece spoilage is down. Operation is so simple that unskilled operators are quickly trained. Currently 2 different sizes are being produced in lots of 300 to 400.

LeBlond-Carlstedt Rapid Borers will solid bore, trepan or counterbore holes 3 to 8 times faster than by the conventional D-bit method! Hole capacity from 5/16" to 4¼" diameter. Handles symmetrical work—round, square, octagonal, tapered or stepped—wide variety of hole diameters and depths, work sizes. Available in three sizes, No. 15, No. 30 and No. 60.

Tell us about the holes you'd like to produce faster. Large holes or small. If the Rapid Borer can handle the job, you'll produce them faster than ever before. Write for Bulletin LC 501A.

LeBlond customer:

Peter J. Salmon Co., Glenside, Pa. Contract machining, specialists in high precision work. Semi-production machining, drilling, honing.

According to Peter J. Salmon, Owner, "*No machinery investment we've ever made has reduced our immediate costs as dramatically as the LeBlond-Carlstedt Rapid Borer. Actually, it competes cost-wise with any other holemaking method for holes as shallow as one inch. On longer holes there's no comparison! Not with the Rapid Borer, which can feed over 30" per minute!*"

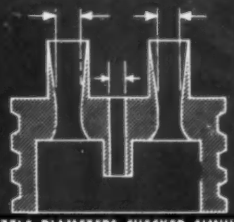
THE R. K. LeBLOND MACHINE TOOL COMPANY

Cincinnati 8, Ohio

LeBLOND of Cincinnati

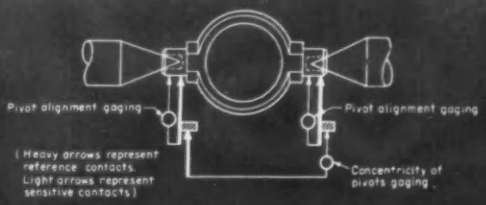
World's Largest Builder of a Complete Line of Lathes for more than 71 years

Precision here



FOUR NOZZLE DIAMETERS CHECKED SIMULTANEOUSLY

Multi-unit air gage (Dimensionair) uses four contact-type air plugs to check diameter of land in nozzles (tolerance ±.0005"). Regular air plug checks centrally located bore (tolerance ±.0002"). Nozzle assemblies and masters shown on gage platform.



GIMBAL CONCENTRICITY AND ALIGNMENT CHECKED

Triple-unit Dimensionair Air Gage simultaneously checks alignment of each pivot with centerline of gimbal, and concentricity of one pivot with the other. Has precision centering stocks which enable gimbal to be quickly and accurately positioned for gaging. Acceptability tolerances are 0.0001".

for performance out yonder

Once an operational missile is launched, it is beyond recall. The precision of its parts will largely determine its success. Hence, its parts and components need a lot of down-to-earth small-figure planning, many times involving production tolerances of .000010", or smaller. The responsibility for maintaining this high precision requires a degree of dimensional control which can be entrusted only to gages whose qualifications have been thoroughly tested and proved.

Federal's long experience in furnishing gages and gaging programs for missiles is your assurance of dependable performance. Our special engineering skill and firsthand knowledge of missile problems have paid off for many producers of parts and components, and they can help you, too.

Whether you need one gage or a whole dimensional control program, we're ready to offer you sound ideas in precision gaging. Write us about your needs.

FEDERAL PRODUCTS CORPORATION
8264 Eddy Street **Providence 1, R. I.**

FEDERAL has supplied precision gaging for:
▸ NIKE ▸ SPARROW ▸ CORPORAL ▸ MATADOR ▸ FIREBEE
▸ THOR ▸ ATLAS ▸ FALCON ▸ DART ▸ NAVAHO ▸ BOMARC

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

Index to Advertisers

The Advertisers' Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

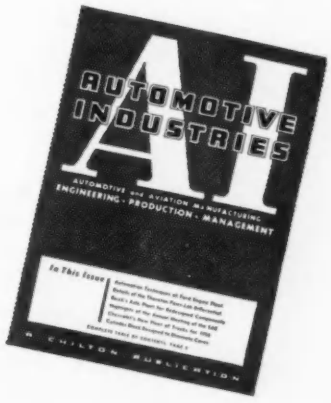
These husky Allis-Chalmers fork-lift trucks, typical of the far-ranging Allis-Chalmers line, are busy on the dockside at Montreal. They are products of the company's Tractor Group, which makes farm tractors, implements and other agricultural equipment, crawler tractors and other earth-moving equipment, materials handling units, and engines.

Who reads **AUTOMOTIVE INDUSTRIES**

at Allis-Chalmers?

The diversified editorial coverage of A.I. is especially valuable to subscribers at Allis-Chalmers Manufacturing Company. Here 93 key men in engineering, production, management and purchasing subscribe to and depend on Automotive Industries for timely technical information they can find nowhere else.

They are representative of the important 21,000 subscribers in some 3700 concerns manufacturing cars, trucks, buses, tractors, aircraft, engines, parts and powered agricultural and off-the-road equipment. They put $15 billion on the line annually for parts, production and plant equipment and materials. The editorial and advertising columns of A.I. provide the men who make buying decisions with up-to-the-minute, authoritative coverage of design and production developments. You'll get action from your ads in A.I.'s well-read pages!



AUTOMOTIVE INDUSTRIES *A Chilton Publication*

Chestnut and 56th Streets • Philadelphia 39, Pa.

Another new development using

B.F.Goodrich Chemical *raw materials*

HYCAR RUBBER SAYS "NO" TO FIREWATER DAMAGE

CHOOSING a material for resilient parts like seals, gaskets, and protectors in firefighting equipment poses a special problem. Water is often pumped right out of harbors and rivers—laden with oil, gasoline and other solvents.

Hycar nitrile rubber is ideal for this service because it is resistant to oils, tars and other hydrocarbons—as well as salt water. Although tough and abrasion resistant, Hycar is readily molded and extruded to make products with the desired physical properties.

Wherever the going is rough on ordinary rubber, you should investigate Hycar. For information write Dept. KF-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Fire-fighting equipment *valves made by Akron Brass Manufacturing Company use Hycar rubber seats made by Jet Rubber and Plastic Company, New Milford, Ohio. Hycar nitrile rubber is supplied by B.F.Goodrich Chemical Company.*

Hycar
Reg. U.S. Pat. Off.
American Rubber

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR American rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

ENGINEERING COOPERATION THAT DEVELOPS FINER ENGINES

ENGINEERING – FOUNDRY – MACHINING

Behind the world-wide reputation of Zollner Pistons is an unrivaled record of service to engine builders. Typical of advancements in piston design provided by Zollner engineering leadership are Clear-O-Matic, Bond-O-Loc, Perma-Groove and many adaptations of Zollner basic design advantages to specific engine builder requirements.

Whatever your needs may be for piston castings or precision finished pistons, we cordially invite your full use of our cooperative engineering service and complete production facilities.

ZOLLNER CORPORATION

FORT WAYNE, INDIANA

DETROIT OFFICE: Jaikin Bldg., Birmingham, Mich.

LIGHTER, STRONGER, BETTER THAN EVER!

the 1958 SHULER

One-Piece Tubular Trailer Axle

Now Shuler offers the finest trailer axle *ever* — a new lightweight axle of 18,000 pounds capacity that retains all the famous Shuler one-piece advantages of the past, plus many new design features:

- Improved upsetting and forging process insures the strongest and lightest axle center that can be produced. Design eliminates all welding in the construction of the axle beam.
- New lightweight fabricated steel brake shoes.
- New lightweight reinforced drums and lightweight forged steel hubs.
- New spring-loaded buna composition wheel bearing grease retainer moulded in "one-piece" and specially designed for heavy-duty trailer axle applications. Simply designed and durable camshaft supports with spherically held bushings insure perfect alignment in camshafts. Removable nylon bushings are provided at both the inner and the outer camshaft bearings.
- Spider is bolted on—not welded—to permit replacement in the field.
- One-piece forged camshafts are coined and hardened.
- Extra-large anchor pins and bushings plus hardened cam rollers and roller shafts, for longer life, better over-all service.
- Brake assemblies are attached to the axle by means of hardened alloy steel bolts.
- Specially designed composition seals at both inner and outer camshaft bearings insure proper lubrication at these important points.

For further information, write or call:

SHULER AXLE COMPANY, Incorporated, LOUISVILLE, KENTUCKY

Subsidiary of Fuller Manufacturing Company

SALES OFFICES: CHICAGO, DETROIT, PHILADELPHIA, OAKLAND AND TULSA

WEST COAST WAREHOUSE
Oakland, California

SOUTHWEST WAREHOUSE
Fort Worth, Texas